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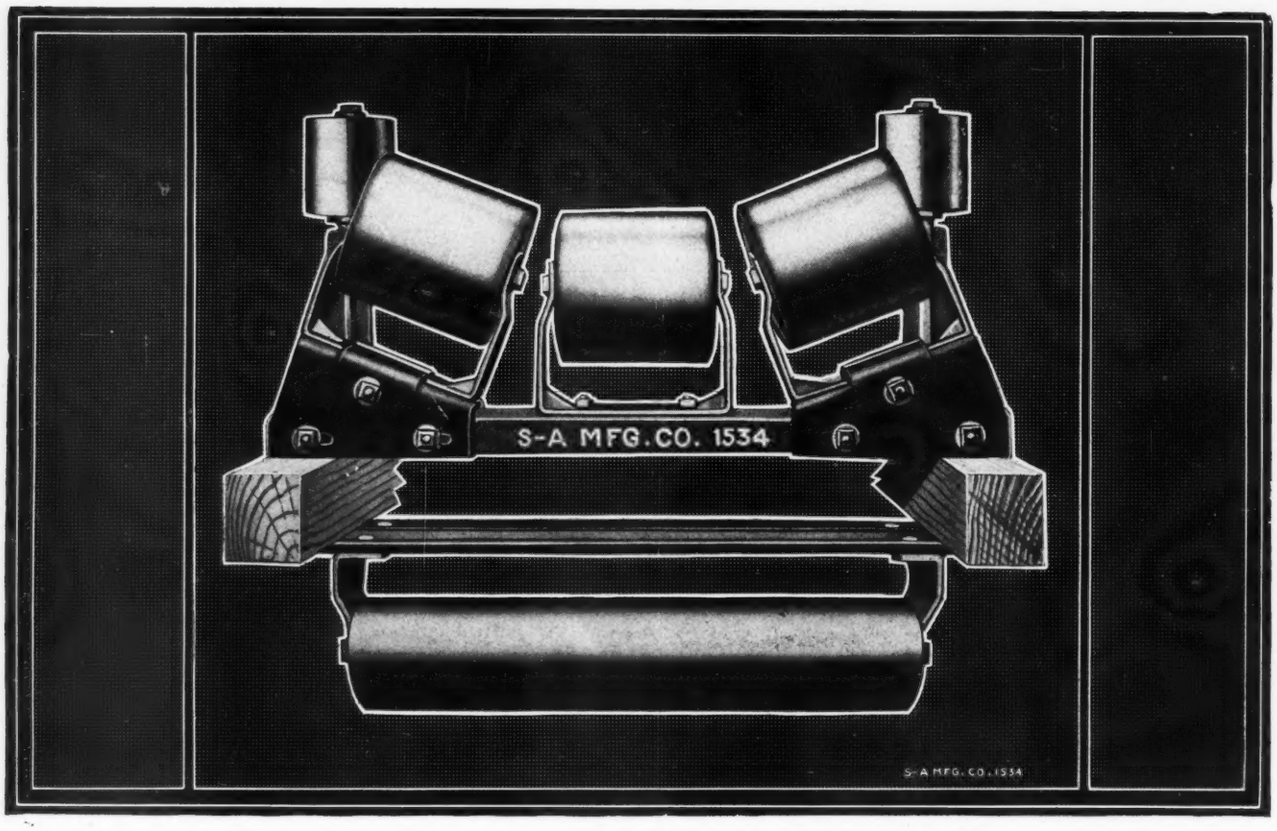
by A. R. Ledoux

Ancient Principles of Modern Machinery
by K. S. Twitchell

The Electrolytic Copper Assay A New Modification
by F. G. Hawley

Sketch of William Wallace Mein
Mining Engineer

The Chilean Mill came out of the East. Syrian prototype shown is used for crushing olives



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Engineering and Mining Journal

A Weekly Journal of the Mining and Mineral Industries

METALS NON-METALS PETROLEUM

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Volume 110 **New York, July 24, 1920** *Number* 4

The Fixed Price of Silver

HOW much better it is to act than to argue was illustrated by Senator Pittman when he quietly put through the legislation under which American silver is now selling at the fixed price of a dollar an ounce, a condition which will probably last for four years or so under the existing act. The Government mints will buy gold at $20.67 and silver at $1; and a fixed ratio is established, after many years of the single standard, a ratio of 20 to 1. The silver so bought will be minted into coins or placed in the Treasury vaults as a reserve against the silver certificates, outstanding or to be issued. Silver is, therefore, remonetized, and all American silver will be turned into currency. The silver that goes into the arts will be foreign silver, purchased on account of its cheaper price in the New York market. Should the world price of silver go above a dollar, our Government would automatically cease to buy, for none would be offered it; but at any fall below a dollar domestic producers could take advantage of the Government-fixed price.

Government price-fixing in general is artificial and injurious, as the war experience demonstrated. But one thing must be fixed—a standard on which all other prices are calculated. Hence the inevitable fixed price of gold. But silver is also a necessary currency metal; its principal use is as a medium of exchange. Hence, the fixing of its price appears proper.

In view of the political and forensic war that has been waged over the question of bimetallism, the fixed silver ratio, and free coinage of silver, no deliberate presentation of a proposition to again fix a ratio in this country would have been listened to for a moment. But the thing is done.

Is there anything but benefit in it? We are of the opinion that other nations would do well to follow suit. France has suffered the loss of most of her silver coins because they were worth more as bullion, for the use of the arts. Most countries are so poor in gold that their financial systems are shaky, and the restoration of exchange rates is one of the world's principal problems. Meantime the operation of gold mines is becoming more and more difficult, and the production of gold ever less. The firm knowledge that all of our silver, as well as all of our gold, was definitely back of currency and bonds would help this country, and the same principle would help the world more than us.

The system is working with us now. We will not call it bimetallism, or any other word by which it was formerly discussed—words are more obnoxious, and more fatal, than ideas. But we actually have a gold standard supported by a silver currency at a fixed ratio to the gold. All the single-standard exponents of the stability of our national system of currency point out that the silver notes are sound, being secured, dollar for dollar, by silver deposited in the Treasury; thereby acknowledging silver as a basis of exchange. We have the system in practice, then. Is there anything injurious about it? We shall have plenty of opportunity to study it during the next four years; for although some of the theorists who wake up to the fact that something has been "put over" on them are clamoring for a repeal, the act will not be repealed, as there is no sensible reason for doing so. We shall find it to be a stabilizer, rather than a disturber; and at the expiration of the period provided for in the Pittman Act we assume that Senator Pittman will move for an extension of the fixed price.

The Bureau of Safety First

IF YOU, Mr. Engineer or Mining Man, were asked to lay out a program for a Government institution devoted to the mining industry, you would among other things establish a weighted ratio between different parts of that industry; i.e., so much time and money for mining problems, so much for ore-treatment, so much for marketing problems, so much for problems involving national policy and assistance. Whether you would make these proportions 30, 30, 30, and 10 per cent, whether you would make a more careful and more varied assignment, is beside the point; but you would lay out the work, as the first thing to do. You would devote so much to metal mining, so much to coal, so much to oil, and so much to the other non-metallic minerals. In short, you would have a program.

Has the Bureau of Mines a program? Looking over the appropriations, both for 1920 and 1921, it is conservative to say that it has not. The fault may be with the Bureau administration, or with the committees on mines and mining, but most citizens would be induced to think that the responsibility lies in the former place. We do not as a rule expect much from Congress or a Congressional committee. Plans and estimates are laid before them by the bureau chief, and they approve some, whittle down some, and reject others. Each Representative or Senator will approve of anything which feeds into his particular home district; therefore items of appropriation which have a local color are easier to obtain than those of only general interest. The initial planning and balancing is the province of the heads of bureaus, who alone have a clear oversight over their own field.

The accompanying graphs show the Bureau of Mines allotments for the fiscal year 1921, which differ only in detail from those for 1920, and also further back. The biggest allotment, it will be seen, is for mine accidents, constituting one-third of the whole; but the third largest appropriation, for mine rescue cars, is also for mine accidents, which brings up the total to 43 per cent, as shown in Fig. 2. Sixth in the list of allotments, in

proportion to magnitude, comes mineral mining, with $125,000, constituting only 19 per cent of the whole. When it is considered that this allotment is for coal mining, metal mining, and the mining of the earthy minerals, the percentage devoted to the dominant metal-

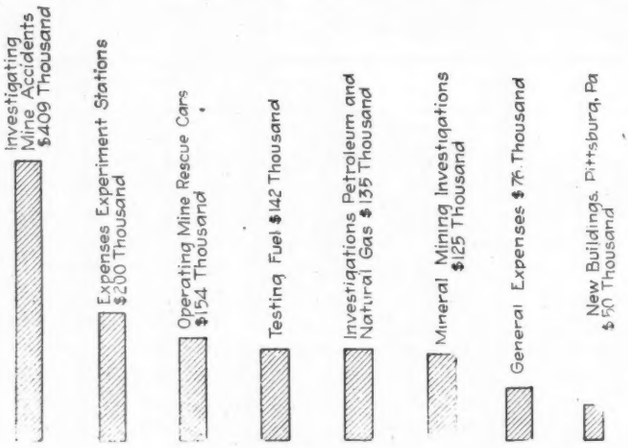

Investigating Mine Accidents $409 Thousand
Expenses Experiment Stations $200 Thousand
Operating Mine Rescue Cars $154 Thousand
Testing Fuel $142 Thousand
Investigations Petroleum and Natural Gas $135 Thousand
Mineral Mining Investigations $125 Thousand
General Expenses $76 Thousand
New Buildings, Pittsburg, Pa $50 Thousand

FIG. 1.

mining industry is seen to be small. Actually, attention to coal mining has always exceeded that of other mining in the bureau.

One allotment that will not offend our sense of proportion is that for petroleum investigations, which stands fifth on the list; and the petroleum division of the Bureau has always been considered efficient and creditable.

As for experiment stations, their multiplication is not in the interest of economy and efficiency; but is intended to secure the support, political and financial, of certain regions. Such support may savor of the pork-barrel, but it appeals more to the Representatives and

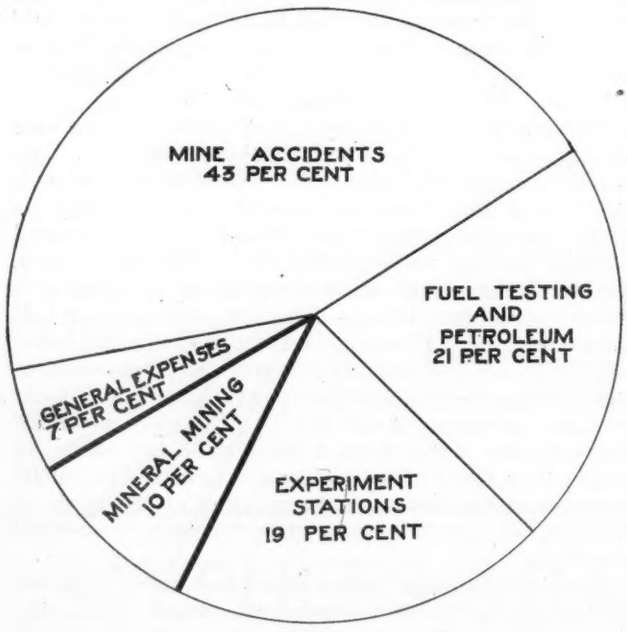


FIG. 2.

Senators of the region involved than do appropriations for general Federal purposes. The multiplied administrations involve heavy overhead and general charges, and loose co-ordination. Work of similar character is often carried on at two or more stations; and the required co-operation, which involves close arrangements with local institutions, especially state universities and mining schools, injects the element of state politics into the management of each, to further complicate the situation. We do not favor the system.

In Fig. 2 we have not only grouped the two mine-accident appropriations, but have joined the two fuel appropriations, to give a general view of how the money that represents the mining industry is segregated. Frankly speaking, is not this graph a deformed monstrosity? The first thing that should be done is to call in an expert from outside to lay out a program; the second, to have the courage to "hew to the line, let the chips fall where they may."

The Engineer in Politics

IN A RECENT communication to the *New York Times*, Dana W. Robbins, referring to the defeat of Herbert Hoover as Republican nominee for President, says that "the advent of the engineer into high political places is once again postponed." The choice of the word is a particularly happy one, and the sentiment expressed by its use is one with which most engineers heartily agree. Our good friend Webster defines "postponed" as merely a putting off; an eventuality which shall some time be realized.

In the meantime it is not improbable that the events immediately preceding and terminating in the Chicago convention will be given careful consideration, and, likely enough, by engineers.

Organization is a well-balanced arrangement, depending on certain vital principles for its proper functioning, whether it be an industrial or a political concern. Any successful engineering enterprise requires the services of an organization, part of which, at least, is made up of engineers. The actual engineering work is not planned and executed by lawyers, by professional politicians and orators, but by engineers. These others may contribute their share toward the entire undertaking, and generally —nay, always—receive their full share of credit.

Engineering was recognized as a profession, but purely as such—if at all—by the great bulk of the people until the affairs of the Great War showed in a startling manner the vital need for engineers. In general, the engineering profession was regarded as a necessary evil, an outlet for the youths of the country who displayed some desire to dabble in science and were unwilling to enter the medical or kindred professions. Engineers did their work well and in an unostentatious way. Rivers were spanned, buildings were erected, transportation systems devised, mines developed and the industrial life of the nation progressed, while the engineer, intent on his individual problems, paid little heed to other affairs which depended so greatly upon the conscientious performance of his task.

But an awakening has come, and the engineer of today feels that "the best is none too good." He requires more than a mere pat on the back; he demands a recognition that is compatible with his accomplishment. And so it was that Herbert Hoover was proposed as the candidate best fitted to represent the profession, in the "highest of the high political positions."

Mr. Robbins continues:

"Nevertheless, a glorious opportunity was shamefully disregarded. That opportunity was the chance for an engineer to demonstrate to the world that if the profes-

sion was not to be recognized in the choice for high office it was because the members of the profession were not accustomed to the light casting aside of their conviction to obtain any office or to ingratiate themselves into the good graces of any group of men, however powerful."

Engineering, as a profession, recognizes no forces save those of nature, and if it is true, as Mr. Robbins says, that "the great problems before the country today are engineering problems—pure and simple," there is little reason to suppose that engineers can be expected to "ingratiate" themselves for the sacrifice of a principle. Such a transition *may* come gradually, as the engineer learns more of the inner workings of the "system," but, on the other hand, there is an insistent demand, ever increasing, for principle in politics. Subservience to the wishes of those who would further their own interests to the detriment of the state does not conform to true engineering ethics.

The Joy of Doing

MUCH of the so-called unrest of the present is due to the loss of the sense of relative values. There is joy in accomplishment, whether it be large or small. The late Theodore N. Vail, out of a lifetime of experience, said in an interview a short time before his death:

> Any man who is not doing his level best is stunting his mental, moral, and spiritual development, to say nothing of his ability. Great heavens! The very greatest satisfaction that a man can get out of life is the knowledge that he is accomplishing something worth while. It makes me impatient to hear and read the utter nonsense so common about money and what its possession can mean and do for a person.
>
> By accomplishing something I do not mean that you must necessarily have done something great, something big, or something unusual. Accomplishment is relative. The boy who delivers messages, the girl who types letters, the mechanic who turns a lathe, the worker who walks the railroad tracks, the telephone operator at the switchboard, the man stringing wires, can earn this feeling of satisfaction that comes from worthy accomplishment just as much, just as keenly, as the chief executive of the great industrial enterprise or the president of a railroad or the famous author.
>
> One's sphere matters little. Everybody wants to feel that he or she has accomplished something. Go into any family in the land, no matter how humble, and before you have been talking very long with them they are sure to begin to tell you of something that either the head of the house or some other member of the family has done. If there is no accomplishment, if none of them has *done* anything they can talk about, then they will at least tell you of something bright or clever that some relative of the family has said.

It is refreshing to hear this sound philosophy from one who has accomplished so much. There is a real joy in work, whether it is barring down a loose slab from the roof of a dangerous working, or pouring bullion into molds. Workmen formerly took pride in their own work; and many of them now, if the truth were known, do have that same feeling toward the tasks that fortune has brought to their hands. We fear that there has been a considerable destruction of this wholesome feeling without an equivalent replacement by something equally substantial. There is too much looking ahead without appreciating what is closest at hand. It is those things which are a part of our every-day life that will bring the joy to each day and produce, as Mr. Vail so well expressed it, "the very greatest satisfaction."

Platinum vs. Gold vs. Silver Monetary Bases

IT IS customary, in speaking of the currency reserve, to picture heavy yellow bars of gold acting as the bulwark and foundation of the monetary system. Hence any announcement which presents another conception of metallic base for exchange mediums is novel—yet according to a recent news item the currency reform law of the Zemstvo government, a Russian provincial administrative assembly, the new money is to be backed by a combination gold, silver and platinum reserve, valued at 71,000,000 rubles. This is an interesting departure, to say the least, and one wonders what prompted the step.

Of the two really noble metals, gold and platinum, the latter is by far the more valuable, and has characteristics that would make it ideal for coinage purposes were it not so scarce, and consequently expensive. Platinum coins are by no means novel—in 1828, after the discovery of platinum in the Urals, the Russian government issued a platinum coinage. At that time the metal had a value a little over one-third that of gold, or about $7.15 per troy ounce. Three-ruble, six-ruble, and twelve-ruble pieces were issued, and the system worked splendidly until the middle of the last century, when the coinage was stopped, for platinum had risen so much in value that the platinum coins were exported for their metallic or bullion content. No doubt the great demand for platinum in industrial uses which was just then beginning to be felt caused the value of the metal to ascend rapidly enough to disturb the existing Russian currency system.

A very few months ago platinum was worth around $150 an ounce—contrast this with $7.15 in the year 1828—and present quotations are between $80 and $90. There is no doubt that platinum admits of great variation in value—so does silver, for that matter—and it would be of particular interest to know what ratio of valuation is to be adopted in the utilization of the platinum reserve or platinum-gold-silver reserve. The introduction of platinum will involve many complexities of a financial nature, but it is far better to build upon platinum than upon paper, which has characterized the procedure of so many European nations, to the detriment of their prosperity.

Safety in Cities

THERE is a vast amount of safety propaganda, and the organization of safety-first associations, committees, and the like goes on apace. All such bodies are doing a good work, and they should call attention to the unnecessary wholesale killing and maiming of pedestrians in our cities. Last year 1,400 persons were killed by automobiles in New York; in June, 1920, the deaths so caused totaled 100, which indicates a lull. Injuries are not taken into account. The pity of it is that it is unnecessary. Except on a few corners of New York, no regulation of its traffic with a view of protecting pedestrians is attempted. On many a corner the "traffic cop" rules over the cross-stream of motor traffic, pedestrians dodging the cars as best they may.

Certain thoroughfares might be reserved for pedestrians, and no vehicles allowed on them. In the ideal city, the sidewalks will be on the second story, on which all retailing will be done; bridges will provide for crossing the street, and the ground floor will be given up to delivery and receiving and general business in which the public does not participate.

WHAT OTHERS THINK

Making Miners Out of Farmers

What a Colorado miner finds when he comes to Arkansas to do work for a company engaged in prospecting is told in the story of W. A. Roderick when he pumped and cleared out the 225-ft. shaft of the old Confederate mine, about eleven miles north and east of Little Rock.

The old mine had been idle for thirty years, and had filled with water. It was virtually covered over when Mr. Roderick arrived on the scene and began to work. That was last December, and it was not until early in June that the water was pumped out and the shaft cleared, all the work having been done by Mr. Roderick alone.

It was amusing to hear Mr. Roderick tell of his experiences with Arkansas miners. He advertised for help, asking for men who had experience in mines. Several answered, but when he took them to the shaft and told them what was to be done, the "miners" developed a strong and fixed determination to remain on top of the earth.

After spending several days in coaxing and persuading, Mr. Roderick began work himself. He used one or two men on the surface to care for the engine and let down proper material to him, but the real work had to be done by himself.

Men stood back from the shaft and laughed at him for going down in the "hole." A "durn fule," a "reckless feller" and "he thinks less of his life than I do of mine," were told him repeatedly, but the 200 or more pounds of Mr. Roderick went down the shaft, tended the pump as it was lowered, noosed heavy timbers, built levels and ladders, endured floods of rain-water that came in the shaft after heavy rains, and never faltered one minute. There were times when the one-man fight against floods and troubles was almost too much for him, but he persisted with grim determination, and about the first of June the original bottom was reached.

The next problem was to get men down to the bottom of the shaft to commence the drifting. Mr. Roderick advertised again, but men would come only to the shaft, crawl to the edge, and look over. After that it was useless to ask them to go down. They had never before heard of mining by digging holes in the ground and never expected to get that far away from sunshine and light.

It would have been a bad job for Mr. Roderick had not a young man appeared who had some courage. Together they descended to the bottom. For three days Mr. Roderick stayed with him to keep him from becoming frightened, and then, just as he thought him to be accustomed to being underground, a pebble fell. Had tons of loose back fallen in the mine, it could have been no worse. The young man wanted to get out immediately, so Mr. Roderick had to repeat the process all over again.

Another three days of training, and he stayed down by himself. After that others went down, and thus it was that a Colorado miner introduced underground mining to Arkansas. If nothing happens, Mr. Roderick believes that he has really made underground miners out of Arkansans.

GEORGE ALLEN.

Little Rock, Ark.

Hot Times in Ciudad Juarez

I hear a good deal of talk and see many articles in the daily papers relative to a "revival of interest" in Mexican mines, owing to a confidence in the new government, but I have no knowledge of any new work that would tend to confirm these statements. An occasional scout is seen here, but I have heard of no deals resulting from the recent visits of any of these gentlemen.

A few months ago, several buyers of manganese appeared here, but it seems that the deposits of this mineral in Arizona and New Mexico are too low grade to be profitable. Two properties are being worked on the Mexican Northwestern Ry., between here and Casas Grandes, by local people. Shipments of ore between 40 and 42 per cent Mn, and low in silica, have been made. It is planned to ship twenty-five tons per day from each of these properties, but one of them is already in trouble, and I expect operations to be suspended, owing in part to incompetent management. Another manganese property is being worked at Arados station, on the Mexican Central, between El Paso and Chihuahua City.

Some silver and silver-lead prospects are being worked along the line of the Mexican Northwestern Ry., and in the vicinity of Villa Ahumada, on the Central.

The country is quiet, but, on the whole, mining is almost at a standstill in northern Chihuahua. Little interest is manifested in El Paso in either oil or in mining.

The only lively section of the country, hereabout, is Ciudad Juarez, Mexico, across the line from El Paso. Aside from many El Paso residents who have the habit, even staid church-going tourists "de peso" and relatives, even to the third and fourth generations, seem to be carried away by the liberty and license of Juarez to such an extent, that the very many saloons can pay divers and heavy taxes and still make money, while the gambling hall, which furnishes craps, faro, roulette, stud-poker and other games, pays $50,000 U. S. currency per month for the mere privilege of being permitted to do business.

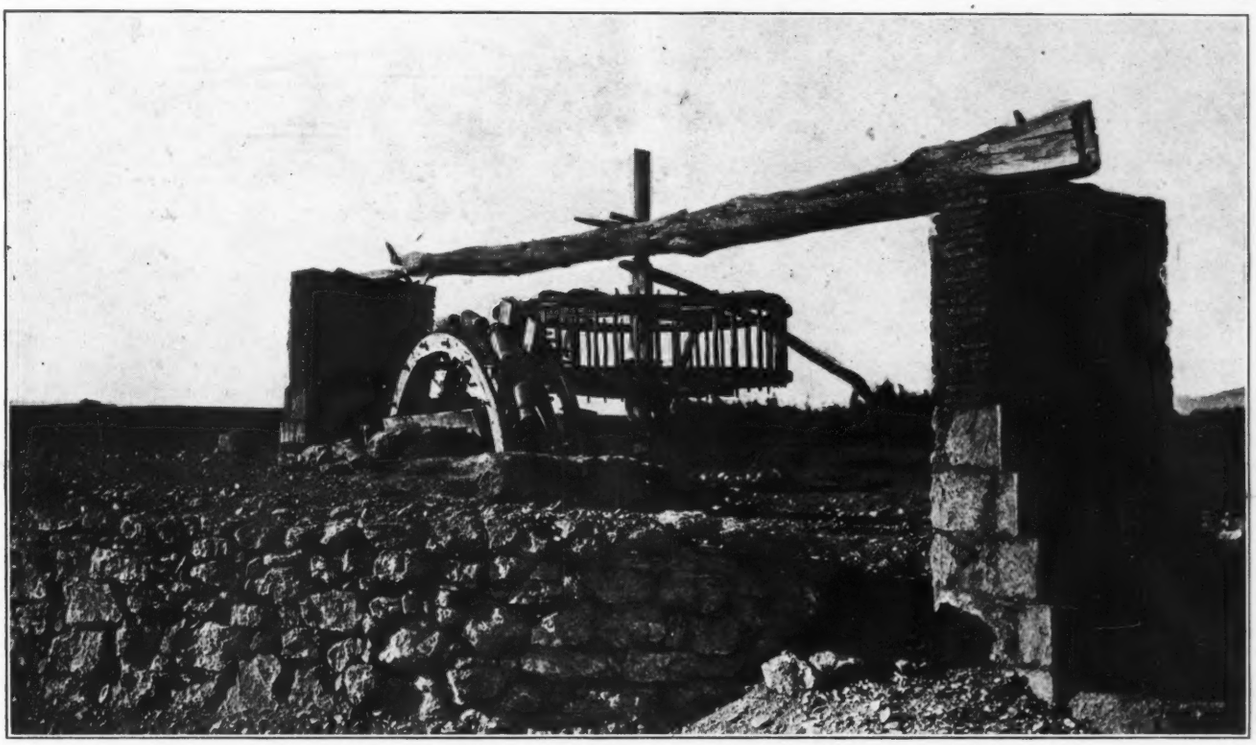
No celebration was staged in El Paso on the Fourth, so that Juarez was jammed with a wet and happy crowd; saloons—gambling hall—bull ring and auto races being generously patronized. The H. C. L. bothers everyone, but I venture to say that Juarez gets an average of $500,000 U. S. currency per day which El Paso would be glad of the opportunity to garner from our sturdy "Give me liberty or give me death" compatriots."

El Paso, Texas. VICTORIO ROMAGNA.

Ancient Principles of Modern Machinery

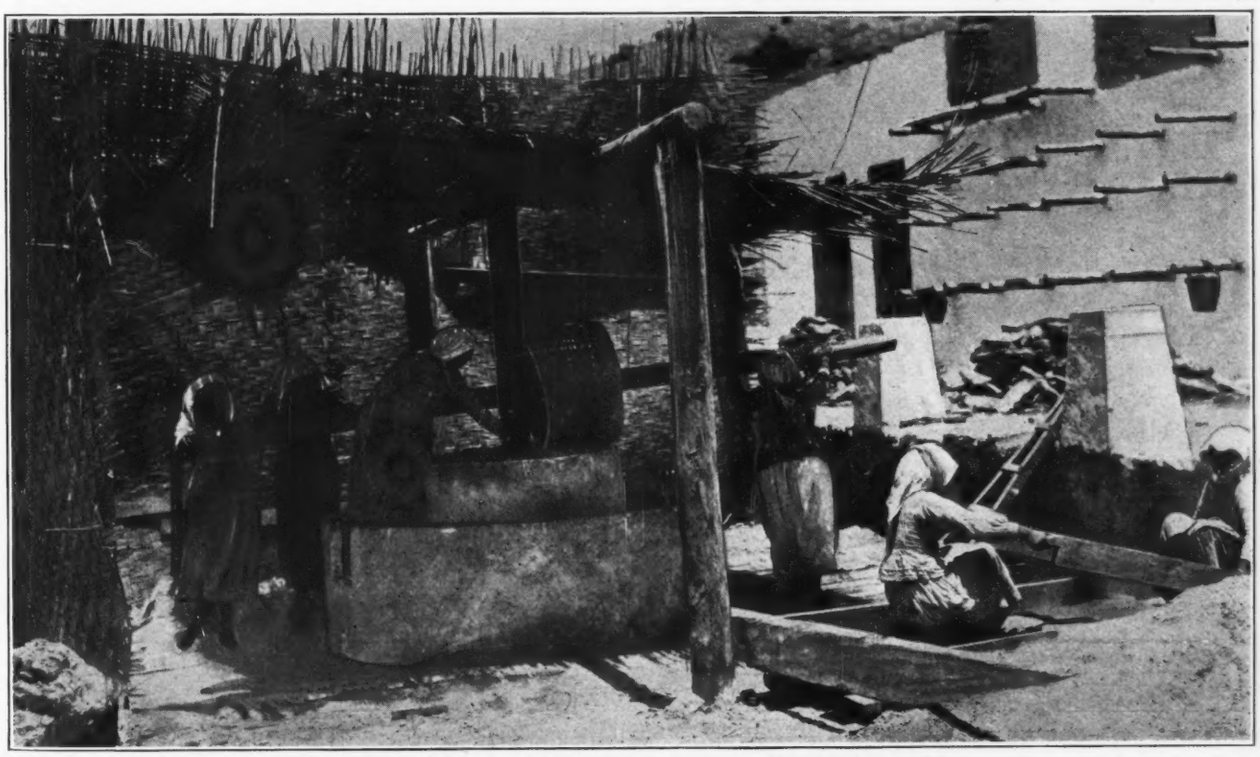
By K. S. Twitchell

Written for *Engineering and Mining Journal*



THE FORERUNNER OF THE BEVEL GEAR

The horizontal wheel is revolved by donkey or mule power, the vertical pins engaging the horizontal pins of the vertical wheel, causing it to revolve. Attached to the latter is an endless chain provided with earthenware water buckets. This prototype of the bucket elevator has been used in its present form from time antedating the records of man.



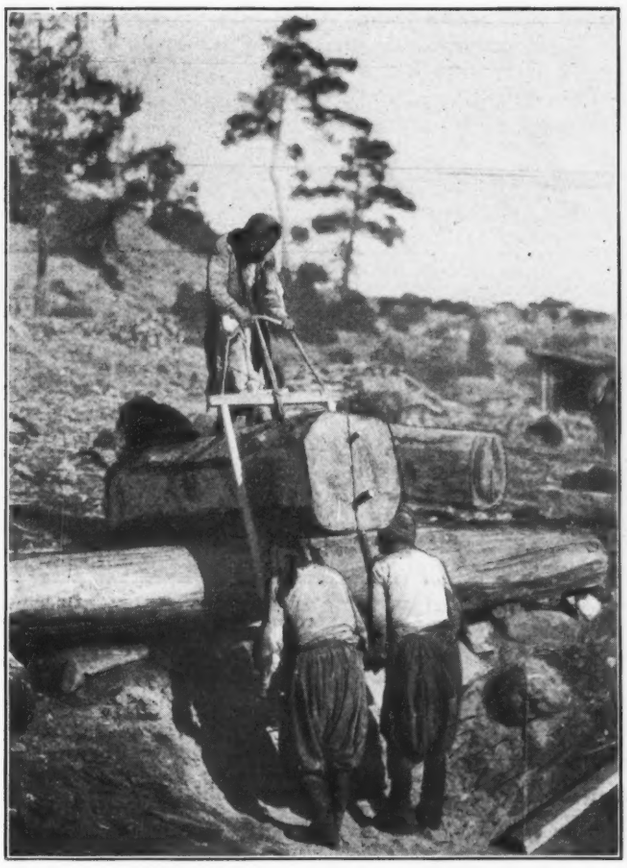
A FOUR-WOMANPOWER CHILEAN MILL CRUSHING SULPHUR

PART OF ANCIENT ROMAN WATER SYSTEM, CYPRUS, SHOWING CISTERN AND PIPE

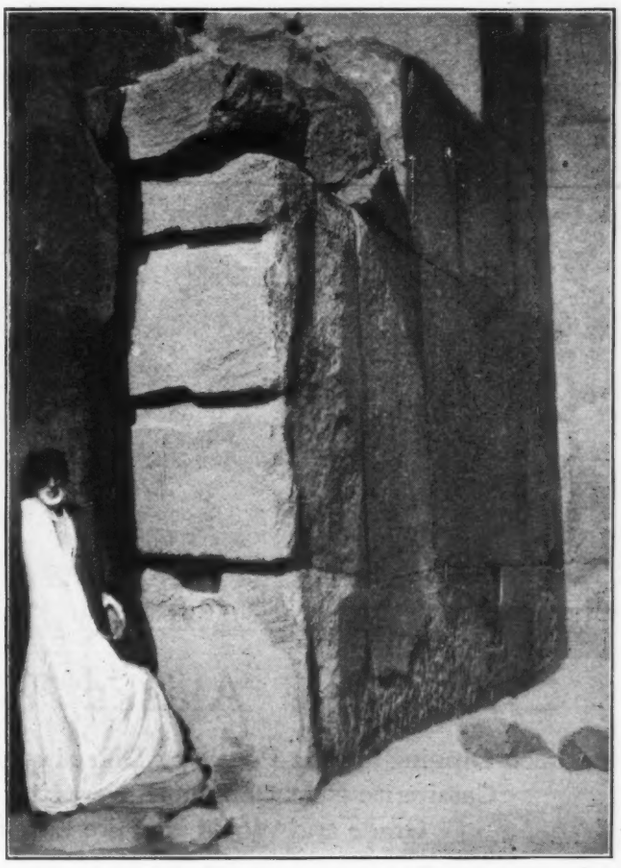
THE EMBRYO DISK CRUSHER. REVOLVING DISKS ARE USED IN THE NEAR EAST FOR CRUSHING GRAIN

The engineer who visits the countries bordering upon the Mediterranean is often forcibly reminded of the fact that many of the principles involved in machinery and construction of the present inventive age were practically applied hundreds or even thousands of years ago. Perhaps it would be more appropriate to call our period the age of rediscovery rather than the age of invention. The cracked and broken concrete roadways laid during the summer of 1919 around New York City stand in strong contrast with the Roman concrete water systems. The cistern shown in the foreground of the upper left-hand illustration was absolutely uncracked when recently uncovered. To the right of the concrete trough lies a terra-cotta pipe, so similar in type to some of the modern cast-iron water pipes that one might imagine himself standing at the brink of a New York subway excavation. Perhaps the disk crushers which are now on the market are, after all, merely patterned from the flour mills of the Near East. The mill shown in the upper right-hand corner has the disks revolving on each other with the center slightly coned to take the feed from the central feed opening. The crushing of wheat in the Near East is done mainly in similar but larger mills driven by water power. The water, however, is not applied in the old over-shot or under-shot method, but as in the impulse type of wheel. The ancients may not have used the counterpart of our hydraulic presses, nor developed machines for testing materials, but they evidently knew how to develop a considerable squeeze, as is evidenced by the primitive screw shown below, which is a part of a press used in making the famous "Commanderia" wine of Cyprus.

WINE PRESS AT KYKKO MONASTERY, POLEMI, CYPRUS. AT THE LEFT IS SHOWN THE WOODEN SCREW, BY MEANS OF WHICH THE NECESSARY PRESSURE IS OBTAINED

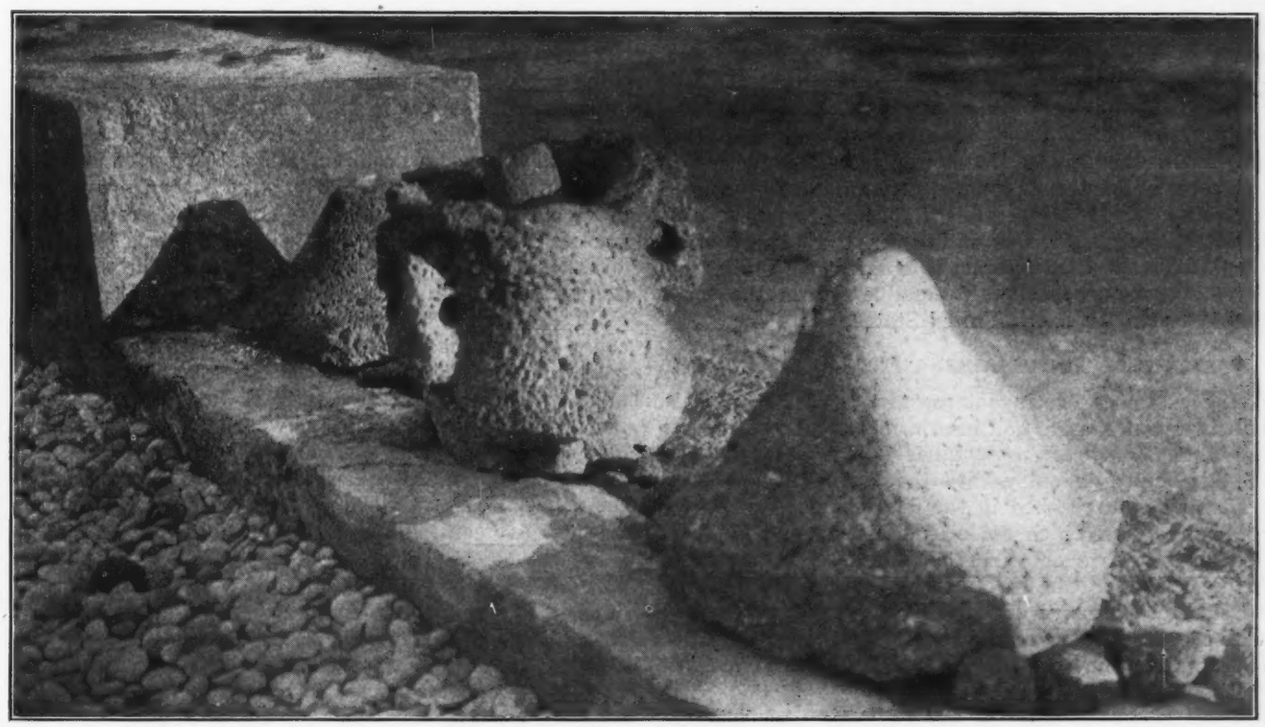


AN ANCIENT GANG SAW IN ACTION



KEYWAYS AT THE TEMPLE OF THE SPHINX

The modern gang saw is seen in the upper left-hand picture in its primitive form. This explains why southern Europe still has timber that will square two feet. Of even more ancient origin is the idea of keying together heavy stonework. At the right is shown the keyways used for the purpose of holding in place the huge granite blocks in the Temple of the Sphinx, which is supposed to have been built about 2800 B.C. The gyratory crusher is another mechanical device of antiquity, its ancestor being shown below. These mills were constructed of a very hard eruptive rock which served admirably for the crushing of grain. The shell revolved upon a stationary spindle, the wheat being fed upon the center of the spindle, while the flour discharged at the periphery between it and the shell. There was no gyratory motion, but this is a mere detail of the modern crusher.



EARLIEST TYPE OF GYRATORY CRUSHER

LOOKING DOWN CASSITERITE CREEK TO THE LOST RIVER VALLEY

Alaska Tin Deposits

Steep-Dipping Quartz Porphyry Dikes in the York Mountain District Show Presence of Cassiterite Near Contacts—Deposits, Still in Prospective Stage, Are of Low Grade and Would Require Large-Scale Operations To Be Profitable

By Frederick C. Fearing
Written for *Engineering and Mining Journal*

AMONG the raw materials sorely needed during the critical days of the war, tin should be placed among the most important, but despite this fact it is doubtful if more than a handful of laymen realized prior to 1914 how much modern civilization owes to this metal, whose early technical history is lost in the mists of antiquity.

Before the war the United States consumed annually nearly half of the world's production without itself augmenting the supply by more than a few insignificant lots of medium-grade tin concentrates. Nowhere in this country are there producing tin mines of even passing consequence. It therefore soon became apparent to those in charge of war industries that every effort should be made to counteract this defect by finding and developing new deposits, if possible within the territorial boundaries of the United States.

Presence of Tin in Alaska Previously Known

The existence of tin outcrops in Seward Peninsula, northwestern Alaska, had been a matter of record with the U. S. Geological Survey since 1900, and by the time of this country's entry into the European conflict a point had been reached in the development of some of these prospects which made examination and study of marked importance and advantage. Accordingly, through the efforts of James F. Halpin, of Nome, Alaska, an extensive expedition was organized by private capital to examine and report upon the possibilities of the situation.

The tin areas which are the subject of this paper are located in the heart of the York Mountain district, Seward Peninsula, Alaska, about seven miles inland from Bering Sea, on Cassiterite Creek, a tributary of Lost River. The location of the district and the available steamship route are shown on the accompanying map of Alaska.

History of Claims in Lost River District

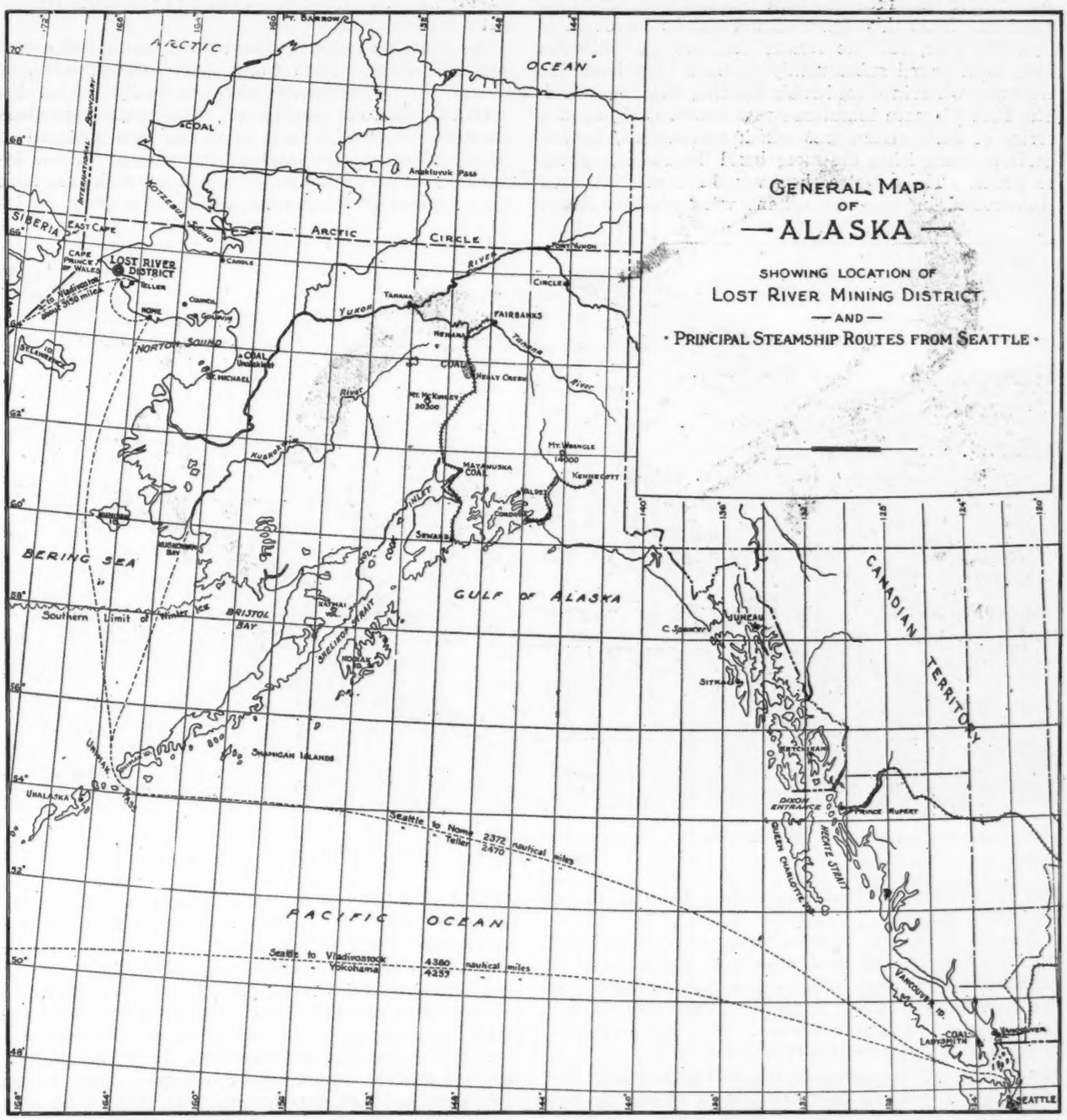
Soon after the discovery of tin in the York region, three prospectors, Leslie L. Crim, Charles Randt, and William O'Brien—with a horse, worked their way through the defile just above the mouth of Lost River and finally staked a group of claims. They found themselves in a country entirely devoid of timber and capable of supporting only a few sporadic patches of rank Arctic grasses and reindeer moss in some portions of the valleys. Sharp, frost-cracked rubble covers the slopes of the mountains, which look as though some giant crusher had been at work throughout the region. Arctic hurricanes of breathless suddenness, long duration, and extreme violence, with wind velocities as high as 120 miles an hour, frequently sweep down from the North. During the summer months, when the slope detritus has thawed out, wind erosion can be observed hard at work moving tons of debris from the heights down into the valleys. Except when frozen, many portions of the hillsides are continually on the move.

Nevertheless, the district is a decidedly healthful one, with excellent water and good drainage. Often, in June, July, and early August, come wonderful days, when the sun eats up the last remaining snowdrifts, and the streams are flooded and the deep violet tones characterizing the Arctic landscape make one forget that the distant hills are not forest-clad. There are still other compensations, for even the athletic Alaskan

mosquito finds the Lost River "chow" exceedingly scarce, and in consequence makes himself conspicuous by his comparative absence.

A small cabin, shown in one of the photographs, was erected by the three prospectors from driftwood packed in from the Bering Sea beach, and mine timbers were similarly obtained. Powder, fuse, caps and supplies were brought from Nome, and development work was started by means of adits and carried on under the most difficult conditions of hardship and financial strain.

One day in 1908, in the dead of winter and while an Arctic blizzard was raging, O'Brien went up the side of Cassiterite Mountain to No. 1 adit, leaving Randt in the cabin and Crim at work on the greenstone. While O'Brien was kneeling over the thawing kettle, eleven sticks of 40 per cent gelatine exploded. It blew out one eye and temporarily blinded the other; it tore the flesh from the thigh to ankle; it crippled one hand. Why it did not kill him Heaven only knows. In this condition he managed to grope his way back down the mountain through the storm, and was finally found by his partners and taken to the cabin. Then followed a 120-mile journey to Nome strapped to a dog sled, and months in the hospital there, with more months recovering later in Seattle; but O'Brien finally returned to the mines to begin again. Crim died, Randt died, and their heirs began a legal battle for control of the property. The old horse which had accompanied the original prospecting party was finally pensioned off. Without adequate financial backing, but with grit enough to spare, O'Brien fought it out alone. By the time of our visit nearly 2,000 ft. of underground work had been accomplished entirely by hand, in spite of all obstacles covering a period of 18 years, and O'Brien was still on the job.



still the hopeful, determined, dignified, and honorable gentleman that the mining engineer not infrequently meets on the frontiers of civilization and remembers always with pleasure and respect.

Geological Formations in the Lost River District

The sedimentary rocks of the district consist primarily of the Port Clarence limestones, of Ordovician Age, whose thickness has been estimated by Knopf[1] at 2,000 ft. That this figure should not be increased is probably wise, for the reason that greater estimates have been found subsequently to have been based on traverses wherein considerable faulting was overlooked. The Port Clarence limestones rest comformably upon a series of older slates, into which argillaceous, banded horizons comprising the more basal limestones, appear to grade. These slates, however, have not yet been encountered in any development work at Lost River,

HEADQUARTERS, ON CASSITERITE CREEK. CABIN OCCUPIED BY THE THREE PROSPECTORS FOR MANY YEARS, SHOWN AT RIGHT

and no outcrops of them are known to exist in the immediate vicinity.

Igneous rocks have invaded these sediments at many points, of which the most important are a series of quartz-porphyry dikes, striking generally east and west and having steep dips. A few of these carry tin, but the majority are entirely barren. They are persistent, however, and vary in width from a few feet up to thirty feet. Some of them have been found to intersect, and hence they cannot all be considered as of strictly contemporaneous origin. One of these dikes, named the Cassiterite Lode, has cut through an older feldspar-porphyry along a portion of its course.

Throughout the world, tin ores are closely associated with granitic rocks, and the top of such a formation, laid bare by erosion, is found southeast of the mine cabin. Here, tin occurs in veins in the limestone, near the contacts, but in small amounts only. As the area of contact metamorphism is not great, and as this granite[2] itself contains 0.3 per cent of tin and, further, as the intrusive is cut by a later quartz-porphyry dike showing considerable marginal chilling and devoid of mineralization, it is thought probable that this particular granite body is of small size; that it was subjected to rapid cooling through contact with the invaded limestones, and that consequently all but a small amount of its dissolved tin content was "frozen" in the original magma without having had a chance to separate from it and form orebodies.

The probable order in which the igneous rocks were intruded in this region were: First, the granites, or perhaps the feldspar-porphyries, and finally, the basalts.

Though reverse faulting of some magnitude characterizes the district, none of it has been observed as having offset any tin-bearing occurrences. In one instance, a tin vein cuts directly across a well-defined fault plane without showing displacement. Similarly, an intrusive rock, from which some tungsten-bearing veins reach out into the limestones, has re-cemented the breccia of a fault outcropping along the bed of Cassiterite Creek. Again, a quartz-muscovite dike has occupied a reverse fault. One slip, of normal type, which is probably of small displacement, has cut off the mineralized intrusive rock exposed in the greenstone workings, and is the only one observed. It is thought that the larger slips, which might otherwise have caused dislocation and high development costs, being older than the tin mineralization, should not be expected to have an adverse effect upon the economical extraction of the ores.

Variety of Minerals Abundant

The locality exhibits a surprising number of minerals. Fifty-two varieties, of which sixteen had not been found previously in Alaska, were reported by Knopf in 1908, and two of these were then new to science. All but a

[1] U. S. Geological Survey Bull. No. 358, p. 12.

[2] U. S. Geological Survey Bull. No. 229, p. 22.

few on the list have already been identified within the Lost River area. Such a variety as this not uncommonly accompanies tin deposits. In the area under discussion the ore-forming solutions were unusually rich in fluorine, chlorine, boron, lithium and potassium, arsenic, sulphur, aluminum, iron, manganese, silicon, calcium, tin, and tungsten, and carried also small amounts of copper, lead, zinc and, in one case, a considerable amount of silver.

These elements gave rise to abundant topaz, fluorite, tourmaline, sericite, albite, cassiterite, and wolframite, which are representative of intense hydrothermal and pneumatolitic genesis. Many of the crystals, especially the quartz, contain liquid and gaseous inclusions. Fluorite and tourmaline are usually intimately interwoven, and sericite mica is prominently developed in close association with both topaz and fluorite.

Thin sections from the more highly mineralized areas invariably show that the original constituents have been completely destroyed, leaving but the faintest pseudomorphic outline, and that this took place before the advent of the tin mineralizer epoch. Other evidence of more than one stage of mineralization was obtained from the veinlets cutting the limestones. Many of these are of contact metamorphic origin, containing principally fluorite and topaz, with no tin, and some were noted to have been cut by a later veinlet rich in tin and carrying also some tungsten. In this further connection the Geological Survey has noted similar contact phenomena elsewhere in the Seward Peninsula tin region—at Ear Mountain—where contact limestones exhibit large quantities of fluorine, chlorine and boron minerals, originally unaccompanied by tin, the metal coming in at a later date.

Tin Occurrence in Dike Walls Shows Contact Effect

From the foregoing outline it is thought that the relatively small amount of cassiterite in the highly fluoritized walls of the dikes is indicative of early contact effects, doubtless produced at the same time that the barren fluorite-topaz veins were forming in the limestone, and that these wall-rocks were thus previously rendered unfavorable for the deposition of tin and tungsten minerals that subsequently took place along the old channels.

The situation may be summed up as follows:

1. The injection of the main quartz-porphyry dikes represents the final intrusive effort of an underlying magma.

2. Following this, aqueo-igneous gases and vapors carrying principally fluorine, chlorine, and boron, but very little tin or tungsten, became active along lines of weakness, both within the solidified dikes—especially along their walls—and also in contraction fissures in the cooling and shrinking limestone. Destruction of many of the original minerals encountered, together with marked contact alteration effects in the sediments, is the principal feature of this period of mineralizer activity.

3. Meanwhile, concentration of tin and tungsten was taking place in the underlying parent intrusive, and finally, as cooling and contraction progressed, these were forced out under heavy pressures and at high temperatures and formed minute vein and impregnation deposits of cassiterite and wolframite within the dikes and rich tin veins in the younger cracks within the limestones.

4. The ores show that a great abundance of mineralizer agents were present during their period of formation and that unusual combinations of minerals resulted; that the deposits vary greatly in texture and composition within short distances, vertically as well as horizontally; that they are of striking pegmatitic habit and might perhaps be best described in the language of Dr. Charles P. Berkey, of the Geological Department of Columbia University, who examined the specimens through the miscoscope, as "aqueo-igneous origin," accompanied by "important pneumatolitic effects."

Metallic Content of the Ores

Up to the time of our visit, the Cassiterite Lode had been developed by adit levels, raises, and winzes, comprising about 1,500 lineal feet, and resulting in the opening up of about 80,000 tons of ore averaging 1.5 per cent tin. For a distance of 363 ft. in No. 3 level, samples, taken at five-foot intervals, showed the presence of an ore-shoot containing 1.75 per cent tin and 0.423 units of tungstic acid per ton. Tin assays as high as 5.48 per cent. were obtained. Nevertheless, this is low grade, and the mine would have to be worked on a large scale before attractive earnings could be expected.

Preliminary milling tests showed that crushing should be carried to about 50-mesh, at which point a clean table concentrate of tin and tungsten can be obtained. The percentage of slimes was encouragingly low. Magnetic separation of the wolframite from the cassiterite should be included in any treatment program. It might be advisable, also, to re-grind the tin concentrates, to break loose small amounts of copper and lead sulphides and arsenical pyrites with which the cassiterite is intimately associated, and then to eliminate these impurities by means of flotation.

Cassiterite has generally been looked upon by geologists as a deep-seated mineral. In Cornwall, England, the lower limit of economical tin mining has nearly been reached at 3,000 ft. below the outcrops. In Bolivia a few of the lodes were first worked for their silver, but as depth was gained silver decreased and the tin content increased. Though the Lost River deposits cannot be said to resemble the Cornwall ores, their complexity of mineralization and mode of occurrence, together with the finding of a rich silver-lead stringer-lode in the vicinity, carrying appreciable amounts of tin and tungsten, impart to them a degree of similarity to a few of the Bolivian mines. On the other hand, in its contact metamorphic aspect, there is quite a resemblance to a secondary impregnation deposit of tin at Schwartzenberg, Saxony. In any event, there appears to be no suitable criterion outside of Seward Peninsula itself from which analogy may be drawn as to the probable depth of the ores in question.

Mode of Occurrence

Evidence gathered by Knopf from Cape Mountain, at Cape Prince of Wales, however, is considered pertinent. In this locality cassiterite occurs, as at Lost River, in quartz-porphyry dikes and in quartz veins cutting limestones. What is perhaps of more importance is that it has also been found within the main intrusive granite mass near the contact borders and as impregnations in the granite walls of fault planes. This latter mode of occurrence is the normal one in the principal tin-producing districts of the world. As it is probable that the Seward Peninsula tin deposits owe their origin to granite intrusions of approximately

the same age, and as the instance mentioned shows that tin ores have been found in this region in the underlying parent rock, as well as above it in the invaded sediments, a continuation of the Lost River ores to and even into the underlying magma could not be surprising. The further fact that the tin in the Cassiterite Lode is associated most intimately with the oldest and most persistent of the existing primary minerals lends additional strength to the possibility.

Depth Rather Than Lateral Development Recommended

The Lost River tin lodes present features of unusual geologic interest and display oreshoots of considerable size. The ores are low-grade, and would have to be mined on a large scale to be interestingly profitable, assuming an average base price of 39.5c. per lb. for tin and $7 a unit for tungstic acid. The deposits are still in a prospective stage and will probably remain so until something definite has been made known through exploration at depth. If prospectors, endeavoring to develop mineralized dikes, would change their tactics and do five feet of sinking for every foot of drifting, in place of doing all of their development by means of adit levels and raises, it is thought that they would benefit materially thereby. If half of the existing development at Lost River had been in the form of a winze, a definite economic status might have been assignable to the lodes long ago. It is hoped that more work of this nature will be done, and that the region's prospects as a tin producer will be further investigated and determined.

Disposal of Used Explosives Containers

There is an element of danger in the use of wooden boxes which have contained high explosives, for very often nitroglycerin exudes from the dynamite sticks and is absorbed by the wood of the box. Although a box that has not absorbed nitroglycerin is safe, yet there is always the danger that a person will get a box that is partly saturated, writes C. L. Colburn in the U. S. Bureau of Mines *Reports of Investigations*.

On account of this danger, all mining companies should use extreme care in giving away used explosives containers. A box that shows any stain of nitroglycerin should be destroyed by fire. Other boxes that are free from nitroglycerin or dynamite can be used.

The condemned boxes, together with the paper linings of all boxes, should be burned in a place sufficiently removed from all buildings.

Care should also be exercised in the disposal of black blasting powder kegs in which loose powder has been shipped. It is difficult to get the last few grains and the dust of black powder out of the keg, and serious accidents have occurred by these kegs coming into the possession of children and others unacquainted with black blasting powder. All used black blasting powder kegs should be thoroughly washed with water before giving them away or utilizing them for other purposes.

Japan's Graphite and Tungsten

Japanese transactions in tungsten and graphite show a marked falling off. Figures available up to Sept. 30, 1919, show a decrease of $747,750, compared with 1918 in the export of tungsten, and for the same period graphite shows a decrease of $254,235.

Porcelain Crucible Recommended For Bullion Assaying

Boiling, Parting and Washing Operations Can Be Performed Most Conveniently and With Absence Of Bumping by This Means

By Roscoe Wheeler

Written for *Engineering and Mining Journal*

IN MAKING bullion assays considerable trouble is often encountered from bumping in the flask, even when means are taken to prevent it. The standard platinum cups and tray are not a solution of all difficulties, for gold cornets can break up in platinum cups as well as stick to them, if not manipulated with the utmost care. I have found from experience that the boiling and parting, as well as the washing of the cornet, can best be carried on in a high-form porcelain crucible or cup, glazed inside and outside. The crucible should be at least 1¾ in. in diameter across the top, 1⅜ to 1½ in. high and of at least 30 c.c. capacity. The upward outward sloping sides allow the bubbles free egression, thus preventing any serious bumping or upsetting. With the flask the top is the narrowest part; the gases and bubbles on ascending are compressed, strike the sides, and bumping sets in no matter how many burnt peas or lentils are used.

One trying such a cup for bullion assays will wonder why it was not thought of before. I can guarantee that the results will rank with the best when such a minimum-sized porcelain cup is used. It is the result of my own practice as well as that of a number of young and old-time assayers whom I have induced to use it. Try it. No regrets will follow.

The British Iron-Ore Situation

Great Britain has for some time been dependent on foreign ores to maintain its production of pig iron, according to *Commerce Reports*. The importation of these ores during the war was curtailed because of the shortage of cargo space, and the country was obliged to fall back on its own low-grade ore and the manufacture of larger quantities of basic iron from these ores. Pig iron cannot today be obtained in adequate quantities from the blast furnaces, because imports of ore are still greatly restricted. A slight improvement in this respect can be noted by a study of the import figures for the last three or four months, and a larger number of ore-laden vessels has arrived from Spain. Despite this, supplies are still below the demand.

Here again, the shortage of British coal is largely responsible. The export of coal from Great Britain and the import of ore from Spain and northern Africa are, in a sense, a form of barter. The same British vessels which take homeward-bound cargoes of ore take outward cargoes of coal. The ore is necessary for the country which exports the coal, and the coal is essential to the ore-producing countries; but when Great Britain cannot produce adequate supplies of coal for export the barter system must necessarily break down. Because of the diversion of vessels to trades on which they obtain cargoes both ways, there is not sufficient tonnage available, even when there is ore for shipment, as, if such vessels remain in the ore trade, they are obliged to go in ballast on the outward voyage and thus raise the shipping cost on the home cargo of ores.

Stories From a Laboratory—II

Salting

BY ALBERT R. LEDOUX

Written for *Engineering and Mining Journal*

THE devious ways of the man who would falsify samples and take advantage of the buyer have often been enumerated, and many of them, of course, were tried on our laboratory. One day a man came in with the statement, which we have often heard, that gold existed much more widely distributed than was realized, but in a form which did not permit of its detection or determination by fire assay. This man stated that even the ordinary granite used in the paving stones of New York City contained gold which he could save by his special process. He wanted us to test this process, and, if it was demonstrated that he was correct, to give him a certificate to that effect. He stated that he wished to be present during the testing, but would not in any way interfere.

Under the pretense of wanting to familiarize ourselves with the process, we got from him his complete formula, which seemed utterly foolish from a scientific point of view. We arranged with him to make the test at a certain hour on a certain day, and he brought in an ordinary paving block from the street. Before the appointed time we went through the test exactly as the instructions prescribed, and, of course, got no gold whatever. The remainder of the rock was set aside, and the next day, when the alleged inventor appeared, we repeated the test exactly as before. The man did not wait until we had actually finished the final clean-up, but paid his bill and asked us to send our certificate, whatever it might be, to the old Astor House.

Very much to our astonishment the second test produced a large button of gold. Two of our assistants had done nothing but watch the man; he had not gone near the test or the furnace, and it did not seem possible that he could have salted the sample before our eyes. However, we sent him a certificate something to the effect that we had tested Mr. So and So's process twice, using the same chemicals and apparatus; that the first test was made in his absence, and no gold whatever was found; that the second test, run while he was present, yielded gold to the value of so much per ton of granite. The man never came back, nor did he write us.

One of the most amusing things was our assay of "Gabriel's Sword." The *New York Herald* and the *Kingston Freeman* published a statement, which excited a great deal of interest, to the effect that two residents of Kingston or vicinity who were out late one night and were passing by a pond were startled by a bright light in the sky, and in a few seconds saw a brightly illuminated object fall into the water near the edge of the pond, with a hissing sound. They had concluded that it was a meteor, and the next day had gone back and had found a strange sword. It was five or six feet long, two edged, with a guard above the handle about eight inches long. It was somewhat bent and very much rusted, but on rubbing off some of the rust strange characters and hieroglyphics were observed upon the metal.

Some time after this a man came into our office, carrying on his shoulder a long box, and asked to borrow a screwdriver. On opening the box he produced this sword. He stated that he was one of the discoverers; that he was exhibiting the sword, charging admission to see it, and that he had been a blacksmith and knew a good deal about metals. He wanted the sword analyzed and a certificate given as to its composition. He was sure it was of celestial origin, "Perhaps dropped by Gabriel," because it was an alloy of iron and silver.

He suspended it and called my attention to the fact that when struck it had a ring like steel, although, as stated, he had reason to believe that instead of being steel it was an alloy of silver and iron. He said he would be satisfied if our certificate would show that it contained any considerable quantity of silver. He showed me the hieroglyphics and letters, which looked like imitations of Chaldean or other ancient script; on running my finger over the characters I could feel a little roughness, and they looked as if they might have been made by penetrating the metal with some fine-pointed tool. They were outlined just as one might outline a diagram on a piece of paper by consecutive pin pricks.

My visitor asked for a file. He said that, of course, he would not ask me to assay filings from the surface of the sword or its handle, because the suspicion might lurk in my mind that he had coated the exterior with some chemical containing silver. He called attention to the fact that the guard was apparently forged or cast as part of the blade and handle, and differed in no respect in appearance from the rest of the sword. He stated that if it would satisfy me he would file off one end of this guard; that we could then put it into a crucible and melt the whole thing and report to him as to its silver contents.

When he took the file I noticed that he examined the two ends of this guard critically before he decided which he would cut off. The file went through the metal with ease, and he handed me a cube, bright where the cut had been made but brown with rust on the other five sides. This was sent to the assay room, and the assayer, fearing that something might happen to the crucible and the assay be lost, as a precaution put the cube on an anvil and cut it in half with a cold chisel, expecting to assay half at a time. To his astonishment he found that the cube had been drilled through by a ¼-in. drill, a plug of silver had been inserted in the drill hole, and where the ends protruded the surface had been smoothed off and smeared with iron rust so that the difference between these two and the other sides did not show.

When the man came for his report we showed him this plug of silver and told him that we regretted we could not give him a certificate and feared that the spirits or someone had been fooling him when they intimated that he had to do with a new alloy and not with a steel which had been forged in some blacksmith's shop in the Catskills.

Of course we all know of innumerable instances of samples salted by vendors. We have detected in placer concentrates the milled edges of gold coins which had

been cut up and added to the sample. We have found the interiors of bags which had been sent to us carefully sealed, all black with nitrate of silver which had been squirted into the sample by inserting the point of a syringe between the meshes of the bags without breaking the seals.

Some of our problems did not have to do with ores or metals, and we were often called upon to do what seemed impossible things. For instance, the agents of a large importing house in Newfoundland sent us a sample of molasses and asked us to determine whether it was New Orleans or Barbados in origin. What we did not know about the comparative characteristics of these commodities would fill a book! We made an inquiry from the New York agents of the shippers as to what, if anything, was the matter with the molasses. They stated that the Newfoundlander of those days sweetened his tea with molasses instead of sugar; that he had always preferred Barbados molasses; that this particular shipment turned the tea black, and that, therefore, the Newfoundland fishermen and farmers refused to buy it. The trade knew very well that New Orleans molasses, though of better flavor and of higher price than Barbados, would turn the tea black, whereas Barbados would not. The analysis showed considerable iron in the sample, and later I learned that the man who had received the order for this commodity had thought to please his new customers by mixing with the cheaper Barbados article a large proportion of the New Orleans product, because he thought it would give a better flavor and would secure for him a continuance of patronage. The Louisiana refiners in those days used iron kettles; the Barbados refiners, copper.

We were once waited upon by a committee of prominent New Yorkers, among whom I remember were General Grant, S. B. Eaton, and Norvin Greene, with the request that we should make a test of a special process for extracting gold from certain southwestern deposits. The committee told this interesting story: They were operating a mine in the Southwest, and had sent their engineer to make some further locations and to register the claims. This engineer, when he went to the local land office, was asked if by any chance he spoke French; as a French count was there with a private car and his countess and servants, and was trying to do some business with the registrar, but could not make himself understood. The engineer called upon the count in his car and offered to be of service. To his surprise the count wanted to register certain locations in an alkali desert, where the engineer knew that very little existed below the sage brush excepting sand and alkali and gypsum. These claims were to be located for gold. The engineer was invited to dine with the count, and in the intimacy of the hour the latter told him this story:

His daughter had married a well-known French engineer. This man had been in the war of 1870, had lost an eye, and, returning to civil life, had done some discreditable things in Paris, had disappeared, and had not been heard of for several years. One day, the count received a letter from the man, postmarked in Arizona or New Mexico, stating that he had been in America experimenting with a process of his invention to save "volatile gold," and had discovered a great area where gold existed in large quantities theretofore unsuspected. It could not be detected by fire assay, but could be got by his process. He inclosed a description of his process and was mailing some of the samples. He desired his father-in-law to divide these samples and first have them assayed by any reputable French assayer, and then, when the latter reported—as he would—that there was no gold present, to give him the sealed envelope containing a description of the process and ask him to repeat the tests.

The count followed these instructions, receiving the report in the first instance that no gold was present and in the second instance that, much to the surprise of the assayer, the samples had yielded a very considerable quantity of the precious metal. Upon reporting these facts to his son-in-law by mail, the latter wrote that he wished his father-in-law would come out and see what he was doing; that their everlasting fortunes were made. The count therefore had arrived with his cook and valet and his charming wife, and in gratitude for the assistance which had been given by the engineer he offered to show him these properties and let him locate some claims for himself or his employers. The engineer had gone out into the desert with the count, found the son-in-law in a little shack surrounded by various chemicals, and this Frenchman produced buttons of gold before the eyes of the engineer. The latter had fallen for the swindle, had located a lot of claims for his employers and taken samples from them. These had been sent to an assayer in the West, who reported gold in all of them by ordinary processes, although the report of the son-in-law, who had kindly assayed these samples for the engineer by his alleged process, showed much larger results. So the engineer came back to New York and reported what he had done, and they had come to consult me.

I told them that of course the chances were a thousand to one that the whole thing was fake, but that I believed the engineer to be honest even if not shrewd. As these claims had been located, I advised that they get a man from Los Angeles or somewhere to go out and take other samples and bring them away without going near the French assayer or giving him an opportunity in any way to salt them. In due time the samples came, and in the presence of a distinguished sub-committee of the owners, and of the engineer, we went through the form of testing the process, particulars of which had been furnished, and of course got no gold whatever; nor did we by fire assay. It was a plain case of salting or sleight-of-hand in the previous development of the scheme.

In the meantime the French count had gone home, and when the American engineer, or his employers, reported to the count the result of this independent sampling and test, very much to their astonishment a cable came back saying that the count had absolute faith in his son-in-law's wonderful discovery; that if the New Yorkers would cable him the amount of money they had expended on the locations, sampling and our test, and would send him assignments of the claims, he would reimburse them in full. This was done, and these lucky New Yorkers got their money back, and the count must later on have discovered that he and such friends as may have joined him were victims of a swindle.

The old gold-brick swindle has not passed us by. A reputable physician from Albany came to us with some borings, which, while he waited, were tested for gold. Asked by him to calculate the value of a bar of such-and-such dimensions, assuming its fineness to be that of the borings we had assayed, we made it up in the thousands of dollars. The doctor said that he had

met a red-shirted miner who had come from the West with all his savings in this bar of gold. He needed money and would sell it for $5,000, but of course did not expect the doctor to pay for it without a test. He proposed that they come to a machine shop where the bar should be bored through. The doctor could take the borings to an assayer and upon his return pay for it if satisfied as to its value.

I warned this doctor that he was on the edge of being swindled, but nothing would convince him. Back he came in a few hours, carrying a satchel and triumphantly produced the bar. One look at it showed that it was brass, and an assay yielded no gold. Later, the victim discovered at the machine shop that while he was away getting our assay the "miner" had taken another bar out from his bag, of the exact dimensions of the original gold bar, and had had the second bar drilled through with holes exactly duplicating in location those made in the previous bar.

I had the curiosity to communicate with the doctor some months later, and found, as was to be expected, that neither through the police nor otherwise was he able to discover who had swindled him.

Ontario's Metal Production

METALLIFEROUS mines, smelters, and refining works of Ontario show an increase in the value of output for the first quarter of the year of nearly $1,000,000 over the corresponding quarter in 1919. Returns received by the Ontario Bureau of Mines for the three months ending March 31, 1920, are tabulated below. For purposes of comparison the quantities and values are given for the corresponding period in 1919.

SUMMARY OF ONTARIO'S METALLIFEROUS PRODUCTION, FIRST QUARTER OF 1920

	Quantity		Value	
	1919	1920	1919	1920
Gold, oz.	98,188	142,840	$2,026,536	$2,953,036
Silver, oz.	3,105,002	2,280,665	3,152,700	2,954,695
Platinum metals, oz.	.....	100	.....	7,172
Copper, blister, lb.	1,724,631	1,508,014	270,493	242,630
Copper in matte exported, tons	2,674	1,976	588,280	553,280
Nickel in matte exported (*a*), tons	5,610	4,571	2,692,800	2,285,500
Iron ore exported, short tons	4,840	44	41,118	322
Iron pig (*b*), tons	14,170	13,428	399,963	344,241
Cobalt, metallic, lb.	13,594	46,479	20,889	108,430
Cobalt, oxide, lb.	127,954	213,024	186,036	340,232
Nickel oxide, lb.	5,070	1,788,183	1,421	413,944
Nickel, metallic, lb.	1,830,569	2,159,316	756,062	753,169
Other nickel compounds, lb.	33,716	159,183	5,804	15,308
Other cobalt compounds, lb.	14,189	1,417	9,827	1,417
Lead, pig, lb.	567,716	509,075	34,684	48,278
Totals	.....	.....	$10,186,613	$11,021,654

(*a*) Copper in matte was valued at 11c. and nickel at 24c. per lb. in 1919. For 1920 the values have been placed at 14c. and 25c. per lb., respectively. The total matte produced contained 7,038 tons of nickel and 3,631 tons of copper.

(*b*) Total output of pig iron was 152,022 tons, worth $3,897,211. Figures in the table represent proportional product from Ontario ore.

Gold

Owing to Ontario's contribution, Canada was the only country able to report an increased output of gold in 1919. Production for the quarter shows an increase of nearly 46 per cent over the first three months of 1919. Of the total output of $2,953,036, Porcupine contributed $2,694,665; Kirkland Lake, $247,339; and the balance, $11,032, came from the Argonaut mine, in Gauthier Township, and from refining of nickel-copper matte. The output from Porcupine came from the following mines: Hollinger Consolidated, McIntyre, Dome, Dome Lake, Porcupine Crown, and Davidson Consolidated. At Kirkland Lake the producers in order were Lake Shore, Teck-Hughes, and Kirkland Lake. Production is still hampered by insufficient labor, and, although the wage scale has been increased to equal that at Sudbury and Cobalt, the effect has not been appreciable. In addition, gold mines produced 24,913 oz. of silver, valued at $31,373. The total tonnage of ore milled was 360,327 tons. As regards mill equipment, the producers report 5,485 tons' daily milling capacity, which includes 210 stamps, capable of treating 3,880 tons. Ball and tube mills installed have a capacity of 1,605 tons daily.

Silver

The quantity of silver marketed during the period shows a falling off, despite the high price of the metal, which averaged $1.30 per fine ounce. When the price began to recede, some of the larger producers held a considerable proportion of their output in the hope that the market would recover. The course, however, has continued downward, the present level being about $1 per ounce. The average price was $1.01 for the corresponding period in 1919. Of the total of 2,280,665 oz., Cobalt and Gowganda contributed 2,244,709 oz., and 11,763 oz. was recovered from nickel-copper refining and 24,193 from gold ores. In addition, certain silver producers were paid $7,111 for 54,518 lb. of cobalt contained in the ores and concentrates sold.

Refineries: At Deloro, Thorold, and Welland the three operating silver-cobalt refineries treated 219 tons of ore, 655 of concentrates, and 626 of residues, for a total recovery of 829,142 oz. of silver, in addition to arsenic. cobalt. and nickel in various forms. Only 5,535 lb. of nickel oxide was marketed in this form, the major part of the output, as noted in the table, coming from the Port Colborne nickel-copper refinery. Metals Chemical, Ltd., at Welland, has sold its plant to Ontario Smelters & Refiners, Ltd., which will carry on the business in future, using a different process. The new company also owns the plant at Chippawa formerly operated by the Standard Smelting & Refining Co.

Nickel-Copper

During the quarter, 301,133 tons of ore was raised and 238,700 tons smelted, as compared with 229,822 and 226,954 tons, respectively, for the corresponding period in 1919. Shipments of matte totaling 10,168 tons were made to the refineries in Canada, United States, and Great Britain. The British America Nickel Corporation is producing matte at Nickelton and shipping to the refinery at Deschenes, Quebec. The latter is now in operation, although there was no output for the first quarter of the year. A considerable part of the nickel oxide produced at the Port Colborne refinery of the International Nickel Co. of Canada is marketed in that form in England. Precious metals—gold, silver, platinum, palladium, rhodium, ruthenium, osmium, and iridium—were recovered at Port Colborne.

Iron Ore and Pig Iron

The Algoma Steel Corporation and Moose Mountain, Ltd., carried on iron mining, 53,754 tons being raised. Only a small tonnage of briquettes was shipped. No shipments of ore were made.

Seven blast furnaces owned by the Algoma Steel Corporation, Canadian Furnace Co., and Steel Co. of Canada were in operation. These smelted 28,608 tons of Ontario ore (8.8 per cent of the total) and 295,273 tons of foreign ore, producing therefrom 152,022 tons of pig iron, worth $3,897,211. The steel product was 179,244 tons, valued at $6,035,308.

The Electrolytic Copper Assay—A New Modification

Proposed Method of Special Advantage in the Presence of Impurities Such as Arsenic, Antimony, Bismuth, Selenium, and Molybdenum—Simplicity and Accuracy Features—Precipitation of the Iron by Novel Process

BY F. G. HAWLEY*

Special contribution to *Engineering and Mining Journal*

WHEN assaying copper ores and products, the analyst has the choice of several methods, varying in speed and accuracy. If accuracy is of prime importance, the merits of the electrolytic method are so great that all bullion, and a great deal of ore and matte, are sold with the specification that this method shall be used in determining their value.

Used on ore containing no interfering elements, the method is simple and satisfactory. A greater weight of sample can be used than with most processes; and this is a great advantage on samples of concentrates that contain a variety of minerals, rendering it difficult to get a small sample to represent the whole. This is especially true with flotation concentrates, which are difficult to mix thoroughly.

Unfortunately, the electrolytic method is subject to a serious limitation. A number of metals will, if present, precipitate wholly or in part with the copper, and vitiate the assay. The most common of these are arsenic, antimony, bismuth, selenium, and molybdenum. These metals are seldom found in large quantities associated with copper minerals, but many ores contain small amounts. Flotation concentrates usually contain much more of the metals mentioned than jig and table concentrates made from the same ore. Silver, tin, and mercury also precipitate, but are usually absent, or present in insignificant amounts. They can be eliminated in a number of ways, but all are tedious and require much care and attention. A slight loss of copper is probable, either chemically or mechanically. This loss may not be great enough to be objectionable for some work, but where the greatest accuracy is required would not be permissible.

Most of the interfering metals do not begin to precipitate until nearly all of the copper has been deposited; then they precipitate with, and on, the last portion of the copper. For this reason, a little impurity usually can be seen easily. However, until one has had considerable experience, it is difficult to judge how much the accuracy of the assay is impaired. Sometimes a cathode which is considerably discolored will contain only a little impurity, whereas a cathode having a much lighter and better-looking deposit may contain several times as much.

EFFECT OF IMPURITIES ON APPEARANCE OF COPPER

If the deposited copper has a smooth, even surface, the different metals form a coating that may vary considerably in appearance, and which is sufficiently characteristic to identify the metal. This does not occur if the copper deposit is rough, for then all impurities give about the same dark color. The precipitation differs with the acids and salts present, but as the almost universal practice is to have the solution contain small amounts of both sulphuric and nitric acid, with some ammonium nitrate, precipitation from this solution only will be discussed.

When arsenic is present in the sample, in amounts less than from 0.2 to 0.3 per cent, little or none of it will precipitate. If present in larger quantities, a few tenths of 1 per cent will remain in solution and the rest will precipitate on the copper. Small amounts give the copper a light grayish appearance somewhat like fine dust, which might easily escape notice even when from 0.10 to 0.15 per cent is present. With larger amounts the color is much darker.

EFFECT OF ANTIMONY AND MOLYBDENUM

Antimony acts much like arsenic, part of it remaining in solution and part precipitating. It will give the copper much the same appearance as arsenic does. The color is somewhat darker, but still a little may escape notice easily.

Molybdenum, in small quantities, is found much more frequently in copper ores than generally is supposed. In the electrolytic assay it acts like arsenic and antimony, part precipitating and part remaining in solution. When too much is not present, the addition of a small amount of any chloride will prevent its precipitation entirely. One milligram of sodium chloride will prevent about six milligrams of molybdenum from precipitating. This small amount of chloride is insufficient to injure the copper deposit. When molybdenum precipitates, the color varies with the amount present. With very little, the color is a chocolate brown that rarely extends to the edge of the cathode. With still more, an iridescent, steel-blue color is evident, that approaches black as the quantity is increased.

When an electrolytic copper deposit that is good otherwise is contaminated with any, or all, of these metals, to an amount not exceeding 0.10 to 0.15 per cent, generally the copper may be purified in this manner:

Place the cathode in a tall 150-c.c. beaker containing enough boiling water to cover the copper. Cover the beaker with a watch glass containing a notch in the side, or a hole drilled through, to let the cathode stem project. Add 10 c.c. of a mixture of equal parts of nitric acid, sulphuric acid, and water, and let stand until all copper dissolves. This takes place so slowly that no copper can be lost by violent action of the acid. Rinse off the watch glass, cool, and again electrolyze. This deposit should be practically pure.

When bismuth is present in the copper assay it does not act like the metals just mentioned. Practically all of it precipitates with the copper, and a second solution and deposition will not improve the assay. When only small amounts are present, the copper has a brick-red color and is covered with small black spots with little streaks projecting from them. These streaks, which average about $\frac{1}{8}$ to $\frac{1}{4}$ inch in length, point in various directions—up, down, and sideways. Under some conditions, finely divided sulphur and some sul-

*A paper read at the Ajo meeting of the Arizona Section of the A. I. M. E.

phur compounds will cause dark spots with streaks, but these are different from the bismuth streaks, as they always point upward, and are much longer. When more bismuth is present, the whole deposit is very dark, and the spots do not show.

When selenium or tellurium is present they precipitate at the beginning of the electrolysis, so if an assay darkens at the start, one may suspect the presence of these elements. As when bismuth is present, redepositing the copper is of no avail.

Several procedures have been evolved for removing interfering elements from copper previous to electrolysis. All are rather tedious, and none are as satisfactory as could be desired. One method used extensively is to precipitate the copper from an acid solution by sodium thiosulphate; then filter, ignite, and again dissolve and electrolyze as usual. As a means of eliminating impurities, not much can be claimed for this method, for nearly all of the interfering elements are also precipitated by the thiosulphate. On igniting the precipitate, most of the arsenic is volatilized, with possibly a very little antimony and selenium. All of the bismuth and most of the antimony will remain with the copper. A possibility of loss of copper by oxidation during filtering must be considered, and also a chance for mechanical loss while igniting the precipitate.

Another method frequently employed is to precipitate the copper as cuprous thiocyanate; filter, and either dissolve the precipitate directly or after ignition; then electrolyze. The separation is usually complete, but small losses of copper are to be expected, as cuprous thiocyanate is slightly soluble, and there is a slight tendency to run through the filter and to creep up the filter on to the funnel. If it is decided to dissolve the cuprous thiocyanate in acid without igniting, it will be necessary to boil almost to dryness completely to decompose cyanogen compounds, for if even a little cyanide remains, it causes the copper to deposit in a loose, spongy form that does not adhere well to the cathode.

Precipitating Copper With Hydrogen Sulphide

Another method sometimes used is to precipitate the copper with hydrogen sulphide; filter and dissolve out the arsenic and antimony with sodium sulphide, then separate the copper and bismuth sulphides by potassium cyanide, and proceed as before. This method is tedious, and mechanical loss is likely to occur.

All of these methods eliminate iron from the assay, which is an advantage, as an excessive amount exerts a disturbing influence on the copper precipitation. Small amounts of iron are not objectionable, and, in fact, may be advantageous, as iron somewhat retards the precipitating of arsenic and antimony. In a standard method for assaying impure copper bullion, a little ferric iron is added to the assay. An excess of ammonia is added and the solution filtered. The precipitated iron hydroxide will retain all arsenic, antimony, bismuth, and selenium, leaving the solution free from these metals. The hydroxide is dissolved and reprecipitated once or twice, to free it from all retained copper, after which the combined filtrates are electrolyzed.

Working according to the procedure indicated, I have formulated a new method for the electrolytic assay of impure ores. I consider this to be the most accurate for the determination of copper in impure ores with which I am acquainted. The time required is about the same as that of any other process in which impurities are removed. It is eminently suitable for control assays, umpire work, and any determination in which the greatest accuracy is required. It has been used for two years in two laboratories, and has always given satisfaction.

Details of the Proposed Method

The method is as follows:

Weigh 1 to 3 g. of the sample into a tall 300-to 400-c.c. beaker. I prefer a Phillips form, but it is not essential. Add approximately 1 g. of sodium bisulphate, 1 g. of ammonium sulphate, and 5 c.c. of 70 per cent sulphuric acid, and shake gently to mix. Add about 5 c.c. of nitric acid saturated with potassium chlorate; after waiting a minute or two, add 10 c.c. more. Cover beaker and set in a warm place for a short time; then gradually heat to boiling and boil off most of the nitric acid. Remove the watch glass, or, better still, set it on edge in the beaker, using the lip to make it stand upright. This is more easily done if a small segment is cut from the watch glass by an emery wheel.

The beaker is placed in a somewhat cooler place, evaporated to sulphuric fumes, and then heated a little stronger until the residue is so pasty it scarcely will flow. Remove and cool. The iron now exists as anhydrous ferric sulphate, which is insoluble in concentrated sulphuric acid, and only slowly soluble in dilute acid. Add about 1 c.c. of water and immediately follow with 50 c.c. of an alkaline mixture made as follows: Ammonia, 2 l.; water, 4 l.; and ammonium nitrate 100 g. Be sure that the pasty acid residue and the ammonia are mixed, then heat to boiling for a few seconds, cool slightly, add 5 c.c. of ammonia, and filter through a 12½-cm. filter into a 250-or 300-c.c. tall beaker; wash once with a little water, then once with warm ammonia diluted with an equal amount of water, and again with water. The main part of the copper is now in the filtrate, whereas a little copper and all of the interfering metals are retained by the iron hydroxide.

Place a watch glass on the beaker, heat to boiling, and continue until most of the ammonia is expelled. If loss is feared from spraying, the solution may be evaporated instead of boiled. Cool the solution and acidify, using an excess of 3 c.c. of sulphuric and 3 c.c. of nitric acid, and place in a cooling trough. While the boiling and cooling is being done, extract the small amount of copper retained by the hydroxide in the following way: Rinse it into the original beaker and place under the funnel. Pour dilute nitric acid around the edge of the filter to extract traces of copper which may combine with the cellulose of the filter and which will not wash out entirely unless acid is used. Wash once, then heat the solution somewhat to dissolve the hydroxide; add an excess of ammonia to re-precipitate the iron and enough 2 per cent solution of potassium cyanide to combine with most of the copper. From two to eight drops will be sufficient. Transfer the solution with the hydroxide to a 200-c.c. tall beaker and electrolyze warm on a rotating electrolytic machine at 0.2 ampere for from twenty-five to thirty-five minutes. All copper, with possibly a little zinc, will be deposited on the cathode, but the impurities remain with the hydroxide.

The next step is to unite all copper in one solution. Switch off the current and remove the beaker con-

taining the hydroxide, but leave the cathode in place. The main part of the copper is still in the beaker containing the original filtrate, which has been boiled and acidified. Put this on the electrolytic stand in place of the one just removed. Switch on the current again, but in the opposite direction, which will dissolve the small amount of copper on the cathode in a few seconds. Switch the current again to the original direction, increase to 1 to 1.5 ampere, and electrolyze until all copper is deposited, which takes from one to one and one-half hours. Remove the cathode, dry with alcohol, and weigh as usual. The deposit should have all the characteristics of perfectly pure copper, showing no signs of impurity. If the sample contains much oxidized mineral it may be necessary to treat with hydrochloric acid before adding the nitric.

If the sample does not contain four or five times as much iron as impurities, it may be necessary to add a little to be sure of removing all interfering elements; however, this is seldom necessary.

The method as given does not remove molybdenum. If this is present, add a small amount of a soluble lead salt just before adding the ammonia solution; then proceed as before.

Necessary Operations Are Numerous But Simple and Quick

The operations required in this method, though numerous, are all simple, easy of execution, and require little time. The possibility of loss of copper, either chemically or mechanically, is, I think, less than with other methods. The complete precipitation of the small amount of copper from the alkaline solution containing the iron hydroxide is done quickly and easily, and the copper in the main solution is precipitated faster and better than it would be if the iron had not been removed.

One of the novel features is the way in which the iron hydroxide is precipitated. When ammonia is added to a solution of iron sulphate, the normal gelatinous hydroxide is precipitated, but if the ammonia is added, as directed, to the pasty residue in which the iron exists as anhydrous ferric sulphate, it is changed to a dense, granular hydrated oxide whose volume is only about one-third as much as the normal hydroxide. It is much easier to filter and wash and does not retain as much copper as does the hydroxide precipitated from solution.

The mixture of sodium bisulphate and ammonium sulphate has several functions to perform. Besides aiding in decomposing the ore, it helps the iron to crystallize out and also has a tendency to prevent spitting, which often occurs with samples high in iron. If much water is present in the assay, the ferric sulphate will form with water of crystallization. This is expelled violently when the temperature rises, and is one cause of spitting. Were it not for this, the addition of water would be beneficial, as it causes the ferric sulphate to crystallize out in larger particles. On adding ammonia, this would result in a more granular ferric oxide, which would be easier to filter and wash.

The nitric acid should not be boiled off too rapidly at the beginning, for if that be done some particles of sulphide might become coated over with insoluble sulphate before they were entirely decomposed.

The reason for adding potassium cyanide is twofold: First, it aids in the extraction of all copper from the alkaline solution, for copper combined with cyanide is not occluded by ferric hydroxide. Second, copper deposits better from a cyanide solution than from one containing only ammonia and ammonium salts. An excess of cyanide should be avoided, as potassium ferrocyanide then would be formed, which has a disturbing effect on the assay. One or two drops excess would not be enough to cause trouble. Although the precipitation of small amounts of copper from a cyanide solution is complete and satisfactory, large amounts cannot be deposited practicably in this way.

If the alkaline solution contains zinc, some of it may precipitate with the copper, but this does no harm, as it is held in solution later, when precipitating from the acid solution.

If no rotating machine is available, the work can be done with stationary electrodes, provided the iron hydroxide present is not enough to interfere with the free circulation of the solution. The alkaline solution should be electrolyzed for an hour or two in the afternoon, with occasional stirring; then changed for the main solution and electrolyzed all night.

Many tests were made to prove the accuracy of the method, but only a few representative ones will be given. The first tests were made on known amounts of pure copper to which impurities were added:

TEST No. 1

In each case 0.2 g. Fe was present

No.		Cu Taken	Cu Found
1	.....	0.2606 g.	0.2607 g.
2	.....	0.2589	0.2591
3	.....	0.2996	0.2996
4	0.030 g. As	0.1459	0.1461
5	0.050 As	0.1286	0.1288
6	0.030 Sb	0.1221	0.1221
7	0.050 Sb	0.1378	0.1379
8	0.030 Bi	0.1279	0.1281
9	0.050 Bi	0.1353	0.1356

TEST No. 2

Each of the following was added: 0.25 g. Fe, 0.05 g. Al_2O_3, and 0.05 g. CaO.

No.	Sb	As	Bi	Cu Taken	Cu Found
1	0 g.	0 g.	0 g.	0.1432 g.	0.1432 g.
2	0	0	0	0.1415	0.1413
3	0.01	0.01	0.01	0.1302	0.1301
4	0.02	0.02	0.02	0.1310	0.1313
5	0.01	0.01	0.01	0.1322	0.1322

TEST No. 3

In each case 0.2 g. Fe was present.

No.	MO_3	Se	Pb	Cu Taken	Cu Found
1	0 g.	0 g.	0 g.	0.1094 g.	0.1095 g.
2	0	0	0	0.0966	0.0965
3	0.04	0	0	0.0906	0.0914
4	0.02	0	0.03	0.0957	0.0958
5	0.04	0	0.10	0.0923	0.0923
6	....	0.01	0	0.0861	0.0863
7	....	0.02	0	0.0940	0.0943

The next tests were made on pure ores, which were assayed by the regular acid method and also by the new method. Other portions also were weighed out, to which impurities were added, and these also assayed by the new method:

PERCENTAGE OF COPPER FOUND BY TWO METHODS

Cu in Ore No. 1, Acid Method	Cu in Ore No. 1, New Method	Cu in Ore No. 1 + 10 mg. Each of Bi, As, and Sb, New Method
22.20	22.20	22.21
22.19	22.19	22.21
.....	22.18	22.19
Ore No. 2, Acid Method	**Ore No. 2, New Method**	**Ore No. 2 + 10 mg. Each of Bi, As, and Sb. New Method**
5.66	5.65	5.64
5.66	5.64	5.66
5.64	5.64	5.64

When determining copper on impure ores containing from 5 to 10 per cent of copper, I have frequently assayed the same pulp six times, using 2 g. portions, and found that the difference between the highest and

lowest result of the six was only 0.01 to 0.02 per cent. These same samples could not be assayed satisfactorily by the regular acid method, because the deposited copper was very dark, and the results were from 0.15 to 0.30 per cent too high.

Early Days in North Arkansas Zinc District

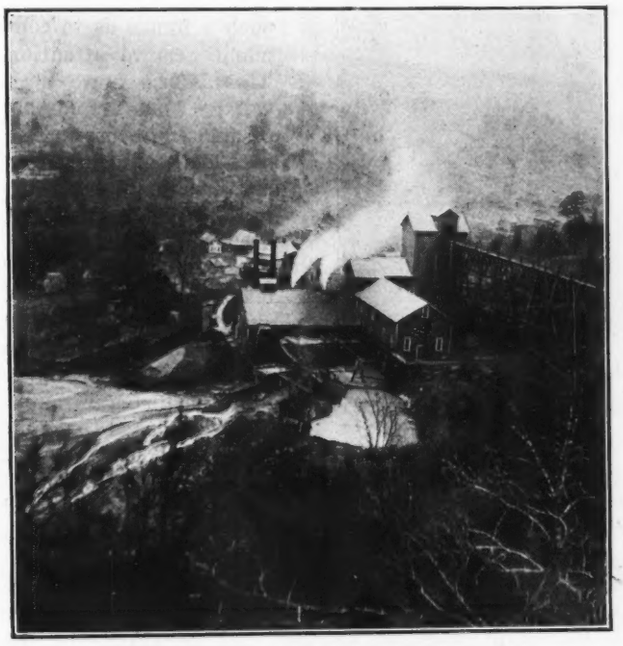
Zinc Carbonate First Taken for Silver Ore and Smelter Erected on Morning Star Property In 1882

By TOM SHIRAS

Written for *Engineering and Mining Journal*

WITHIN a stone's throw of each other, on the Morning Star property at Rush, Ark., are two plants that aptly illustrate the progress of development in the north Arkansas field during the last thirty-eight years. The first is a small crude stone smelter, built on the same plan as a lime kiln, with which a group of early-day prospectors tried to extract supposed silver values from zinc carbonate ore. The second is a modern 200-ton zinc concentrator which has milled thousands of tons of carbonate ore.

The stone smelter marks the first attempt ever made in the field to construct a plant that would actually yield a marketable product. At that time zinc carbonate had no value in the field, owing to the fact that the nearest railroad was seventy-five miles away. It is a common story in the district that the men who constructed the smelter thought the zinc carbonate was silver ore. John Wolfer, one of the oldest prospectors in the Buffalo River country, who located the property, denied that this was true, however, in an interview given just before he died, eight years ago. He had been a member of the group that was working the property as a claim when the smelter was erected in 1882.



MODERN 200-TON CONCENTRATOR HANDLING ZINC CARBONATE ORE AT RUSH, IN NORTHERN ARKANSAS

Wolfer stated that they had their ore assayed, and that the returns showed that along with the zinc it carried $8 per ton in silver. As the zinc had no value then, he said, they built the smelter in an attempt to save the silver, which could be easily transported in bullion form. They were woefully disappointed, however, for there was no silver in the ore.

In making this test the furnace was charged with charcoal and ore, and a sand mold made at the bottom for the silver to run into. Then the owners stood back and waited expectantly. After a short time they noticed beautiful rainbows playing in the air over the blast. This was the zinc going off in fumes. No silver flowed from the bottom. They were so discouraged that they offered to trade the claim, furnace and all, to Carter Gutherie, a prospector, for a can of cove oysters, but he turned them down cold.

OLD STONE SMELTER AT RUSH, ARK., BUILT TO TREAT SILVER ORE FOR WHICH ZINC ORES OF DISTRICT ARE SAID TO HAVE BEEN MISTAKEN

Later Captain George Chase, of Fayetteville, Ark., developed a large body of carbonate on the property, which is still being mined. The majority of stock in the company has been acquired by Pittsburgh interests.

Old John Wolfer, the original locator, died poverty stricken within a few miles of Rush, at a time when the mine was making big money for its owners.

The New Geology

In connection with recent earthquakes in Mexico a darky preacher down in Texas is said to have evolved a remarkable theory, which seems to fit in very well with certain existing circumstances, according to the *C. W. Savery Market Letter*. He promulgates his theory of the earthquakes as follows:

"We has received anudder warnin' not to go pesticatin' into de ways ob Providence. De earf, my breddren, revolutes on its axels, as we do now all know, and we all know dar mus' be sumefin to grease dem axels and it takes a right sma't ob grease to do it. So de good Lord done put de 'troleum inside de earf to keep de axels greased. Den byme bye 'long come all dese hyah oil companies, punchin' holes down into the bearin's and de oil all come squirten' out. Fust thing we know dar's a hot box, and de earf squeaks and jolts and rumbles and dat's de earfquake, and if dey don't quit pretty soon dere won't be no moah grease left and the earf will stick tight on its axels and won't go round no moah!"

Mining Engineers of Note

William Wallace Mein

THE first settlements in the vicinity of Nevada City and Grass Valley, Cal., were made in 1848, and were trading posts. Placer mining became active, and resulted in the beginnings of a mining community. In 1850, gold was discovered in quartz veins near Oroville, and speedily thereafter in the immediate neighborhood of these two rapidly growing towns. In 1853, quartz mining interests, after their initial campaign, became prostrated, and it was not until 1864 that the returning miners from the Washoe district of Nevada caused an active resumption in gold-quartz mining. The gold mining industry took on its swaddling clothes in this region. The first sluice was used in 1850, hydraulic mining was discovered in 1853, and the first quartz mill was put in operation on "cemented gravel" in 1857. From that time on the stamp mill was developed steadily. The auriferous sulphides presented a difficulty which was overcome by the introduction of the Plattner chlorination process. In 1873 a survey for a narrow-gage railroad was made of the territory lying between Nevada City and Grass Valley. It was in this mining atmosphere that William Wallace Mein was born about the time that the railroad between the two mining villages began to be constructed. His father, Thomas Mein, achieved a high reputation as an engineer and manager among a group of engineers who found ample opportunity for their capabilities in the gold mines of California. Thomas Mein was general manager of the Alaska-Treadwell mine, of the Robinson Gold Mining Co., Johannesburg, South Africa, and consulting engineer for the Alaska Treadwell group of mines, the Oneida, Mariposa Grant, and many others. Mr. Mein, Sr., was associated with Hamilton Smith, H. C. Perkins and Hennen Jennings and was identified with the London Exploration interests and Wernher Beit & Co. He was a prisoner with many other mining men in the Jameson raid in Johannesburg.

WILLIAM WALLACE MEIN

William Mein is a modest man and only his immediate associates and friends know of his technical and executive ability. In the beginning he was not averse to starting at the bottom, as he took a "mucking" job in Alaska and then worked on shift in the chlorination plant of the Robinson Mine, South Africa. Subsequently he returned to California and entered the University of California, from which institution he was graduated from the mining department. A year later he became manager of the Durban Roodeport Deep, at Johannesburg, South Africa, and after three years in this position accepted a similar post at the Robinson Gold Mine, where he remained for three years. He then became consulting engineer for the Robinson, New Modderfontein, City Deep, Ferreira, Village Deep, and other large mines in the South African gold field. During his managerial administration he never lost sight of "Treadwell Costs," and succeeded in reducing operating costs to such a figure as to command general attention. This is the more noteworthy when the number of able engineers in that field at the time are considered. Jennings, Hammond, Webb, Honnold, Yeatman, Hellman, Seymour, and Behr need only to be mentioned to show that real ability and character were quite essential in the running with such team mates. South Africa at that time was the greatest technical experience school in mining in the world.

California supplied many engineers with their initial impetus in gold mining. Those who went to South Africa found a bigger problem. There was greater extent and more uniformity to the gold deposits. There was opportunity to consolidate smaller mines into larger units, with resultant economy in operation. In the midst of much of this activity Mr. Mein played his part well and when he returned to the United States in 1910 he was qualified indeed to take up his professional practice as a mining engineer. He at once became identified with California mining interests, and in 1912 became consulting engineer for the Dome Mines, in Canada. The International Nickel Co. and the Canadian Mining & Exploration Co., during its period of greatest activity, received the benefit of Mr. Mein's technical knowledge.

Mr. Mein has traveled extensively in Alaska, Canada, South Africa, Central America, and the United States.

BY THE WAY

Safety First

A kick of the Widow Leary's cow upset the lamp that started the Chicago fire, and again it was the kick of a cow that recently exploded a box of dynamite on a ranch at San Ramon, Cal., where the powder was used for blasting stumps. The primary cause of the accident was one Tahw, a Hindoo employee, who struck the cow that kicked the box, which blew up, thereby cutting short the nursery rhyme. Tahw was thrown about 200 ft. and badly injured. The rancher suffered in similar manner and several buildings and five animals were destroyed. Here is meat enough for a sermon a yard long on "Safety First." There is nothing new in the use of dynamite for blasting stumps, breaking up log jams and similar purposes. There is also nothing new in the saying that "familiarity breeds contempt."

At Nelson

Talking about kicks, it is noted that the committee in charge of the Third International Mining Convention, which has been in session the past week at Nelson, B. C., has advertised very prominently that

There's a Kick in every Smile—at Nelson!
There's Dew in the mountains Still!

Under the circumstances the attendance at the convention has probably been excellent.

Purse Strings and Shoe Strings

The man who holds the purse strings in a mining enterprise may be and often is a manufacturer of shoe strings or other commodities. This is one of the things often not at once apparent to the young engineer, but which he speedily comes to recognize. To him who would become prominent as a mining magnate we suggest that first he accumulate a fortune in some other line, such as editorial work, for example, and then enter the mining game from the top. Such is our intention. There is always room at the top, as one finds when he gets there. The latest to enter by way of the top is Mack Sennett, of movie fame, who, with associates, has recently acquired a group of quartz claims not far from Grass Valley, California. The scenery there is not displeasing, and perhaps Mack is looking simply for a realistic background for some thrilling scenarios.

The Higher the Fewer

"Thee mustn't think, m'son," said Cap'n Dick, "that this 'ere Jan Trembath wuz a fool. Any'ow no more so than some o' these young h'engineers o've been to college an' then try to learn old chaps like I 'ow to dig tha h'ore. With h'out boastin,' m'son, mos' o' this 'ere minin' I naws I didn't learn un, it jus' grawed, an', dam-me, didn't come from any bloody book either. Well, any'ow, Jan, 'e figgered to put a bit by for to take a trip back long way sometime, so to begin savin' 'e built 'imself a log 'ouse an' started batchin'. Made 'imself a chair or two h'out o' some boards, an' a table, an' all tha res' o' tha fixin's. Then 'e 'ad a stove set h'up baout four feet from that floor—sort o' foundation it were. One day h'in come two o' these 'ere young h'engineers to get theyselves warmed h'up a bit, an' w'en they saw tha stove, set h'up on tha foundation, they started h'arguing as to w'y Jan 'ad putten there. One chap, 'e sez it wuz to get tha 'eat near tha roof w'ere tha col' wuz, an' tha h'other called tha firs' a bloody fool cause tha 'eat would go h'up any'ow. An' they were snappin' away at h'each h'other jus' like a couple o' fishwomen or some o' these 'ere Polish women w'en one thraws a h'ol tin can h'over tha fence h'in tha h'other's yard—thee naws 'ow it gaws. One o' they chaps talked 'is 'ead off baout tha laws o' thermodam somethin,' an' w'y 'eat makes things 'ot, an' tha h'other told all 'e nawed baout British thermal h'units. Then in comes Jan, an' they h'asked 'im. An' Jan sez, 'I put tha stove h'up cause tha pipe wern't long enough if I putten daown.' So, you see m'son, Jan didn't 'ave to 'ave no schoolin' to naw that."

Blister Copper

"A British syndicate proposes to set up a £10,000,000 copper refinery at Newton Abbot, in Devonshire, on a site where the requisite electric energy can be generated from the lignite deposits at Bovey Tracy," says a contemporary: "There is at present no electrolytic refinery in Great Britain, 90 per cent of the copper used in British industries being imported from the United States. It is hoped that the new refinery will produce 100,000 tons of copper annually, using as far as possible British copper in blister form—an English process of copper-smelting which raises blisters on the white metal after calcination."

Nobody Has Nominated the Kaiser

Most Americans will vote this fall, with mental reservations and by the process of elimination. As a little helper in the process of elimination, we note that Governor Cox declared at Cincinnati in October, 1916:

"Two of the leading sponsors for Justice Hughes are Elihu Root, of New York, and Theodore Roosevelt, of Oyster Bay. In his first speeches Mr. Root declared that the President should have intervened when the Germans went into Belgium. Theodore Roosevelt said this Government should have seized every ship in American harbors. Both have criticized the President for not doing the things which would have embroiled us in a war with Germany.

"The Germans are getting their eyes opened, and about one more speech from Teddy and the German-Americans will join in a triumphal victory for Woodrow Wilson in November."

In the same month, Governor Cox's newspaper, the *News*, said:

"Every indication now is that, with tens of thousands of these splendid people [Germans] still sympathizing with the fatherland, still believing in the righteousness of the German cause, still hopeful that Germany will win, there is every evidence that they will vote for President Wilson for re-election as the best means of aiding Germany, as well as because the re-election of President Wilson will be an aid to the United States."

We are entirely non-political, and reflect the opinions of each subscriber. All of our German and pro-German friends who are on our subscription list will perhaps be enlightened as to how to vote by the above; and those of the opposite persuasion may, if they wish, charitably realize that Cox was after the German vote, and didn't mean it. He says so himself. Certainly, he cannot catch the American vote this year with the same bait.

CONSULTATION

Radium Resources

"The mineralogical scheme I have used for the determination of minerals is not satisfactory for carnotite ore. Is there any regular method of detecting this ore? What is its chemical composition? Do you think the resources of radium-bearing ores will increase throughout the world? Any other information that you may give me about this fascinating mineral that will enable me to become more familiar with its uses will be greatly appreciated."

Carnotite is difficult to classify in any mineralogic scheme for the determination of minerals, hence it is frequently omitted in tables systematically composed for that purpose. Its chief distinguishing feature is its canary yellow color and its usually pulverulent form in minute scales; although often it is compact and wax-like. The greatest carnotite fields in the United States lie in Montrose, Mesa, and San Miguel Counties, Col.; and in Moab and La Sal Counties, Utah.

The three metals, radium, uranium, and vanadium, are found closely associated in carnotite ore, which has the chemical composition as generally given, $K_2O.2UO_3.V_2O_5.3H_2O$ (the radium content, although most important, is too infinitesimal to appear in the formula).

The market value of carnotite therefore will depend not only upon the radium contained in the ore, but also upon the value of the vanadium and uranium constituents. Considering the probable future of radium first, the world will have to turn more and more to the United States as the chief source of this element. The Austrian deposits are almost entirely depleted and the pitchblende deposits of Cornwall have not given any great promise of important development. Outside of the small known deposits in Australia and Portugal, a rare radium-bearing mineral occurs in Russian Turkestan and is called a hydrous-calcium-uranium vanadate, which may prove to be an important foreign resource.

The vanadium content of carnotite is of growing importance as the increasing use of that metal in alloy steel manufacture bids fair to create a steady demand for vanadium-bearing ores—witness the monopoly which one large steel company has obtained over the most important vanadium-bearing area in the world in an endeavor to procure an adequate supply of this important metal for steel manufacture. It is strange to consider vanadium as a byproduct in the extraction of radium from carnotite ore when the quantity of radium in the ore is so small, yet such it really is, being separated as oxide or iron vanadate and reduced in the electric furnace to ferrovanadium.

Enormous concentration of carnotite is required to produce a perceptible amount of radium. Authorities have estimated that about one million pounds of ore will yield only a grain of radium. The effort expended in producing a relatively small amount of the metal is stupendous. First the ore has to be concentrated by either wet or dry methods, which give no exceptional difficulties, the ore merely requiring crushing and agitation with water to separate the finely ground carnotite from the associated silica particles. The metallurgical treatment of the concentrates is the laborious part of the procedure, considering the large amount of material that must be handled. This part of the process may take place in the laboratory. There are several methods of extracting the radium, more or less complex. Experimentation is continually progressing in an attempt to perfect the extraction of radium from its ores. A discussion of any of these methods would be too involved to be detailed here. Briefly, there are acid and alkaline leaching methods and fusion methods. Alkaline leaching employs hot sodium carbonate to eliminate the vanadium and uranium, while the acid leach uses hydrochloric or nitric acid to extract the radium, vanadium, and uranium from ores free from sulphates. In the fusion methods sodium carbonate has been used as a flux, followed by a sulphuric acid leach.

The future of radium-bearing ores in general appears particularly bright, due to the limited world resources and the great demand for both radium, on account of its remarkable properties, and its associated metal, vanadium. Unlike many other ores the market is stable, as it is not subject to the great fluctuation characterizing the trading in the more common and easily obtained minerals.

Getting a Market for Arsenic Ore.

In our issue of July 3, we advised that we did not know of any market for arsenic ore. We have, however, a letter from our Western Editor, who advises that there is an inquiry at his office for an arsenic supply. Miners of arsenic ore in the Far West who wish to market their product should address George J. Young, Western Editor, *Engineering and Mining Journal*, Rialto Building, San Francisco, Cal., or communicate with the companies mentioned below.

We also have several other communications, one of which, from the U. S. Smelting, Refining & Mining Co., says in part: "I note in the July 3 issue of *Engineering and Mining Journal*, page 23, a letter regarding a market for arsenical ores. Our company has recently begun the manufacture of insecticides at our Midvale, Utah, plant, and we need more arsenic. Could you let me have the address of this party?" (Signed) F. B. Weeks, 900 Newhouse Bldg., Salt Lake City.

A statement from L. G. Eakins of the American Smelting and Refining Co., 120 Broadway, New York City, has also been received, who states, "It so happens, owing to peculiar conditions, that our company might be in a position to handle ore such as is described, depending of course upon its location and other important conditions."

The American Metal Co., of 61 Broadway, New York City, is also in the market for this material and states through Edward K. Judd, "If the deposit appears to be of suitable character and conveniently located, we might be interested in looking further into the matter."

Interested arsenic ore producers would do well to get in touch with the above means of disposal for their product, as indications point to an unusual demand for suitable material.

THE PETROLEUM INDUSTRY

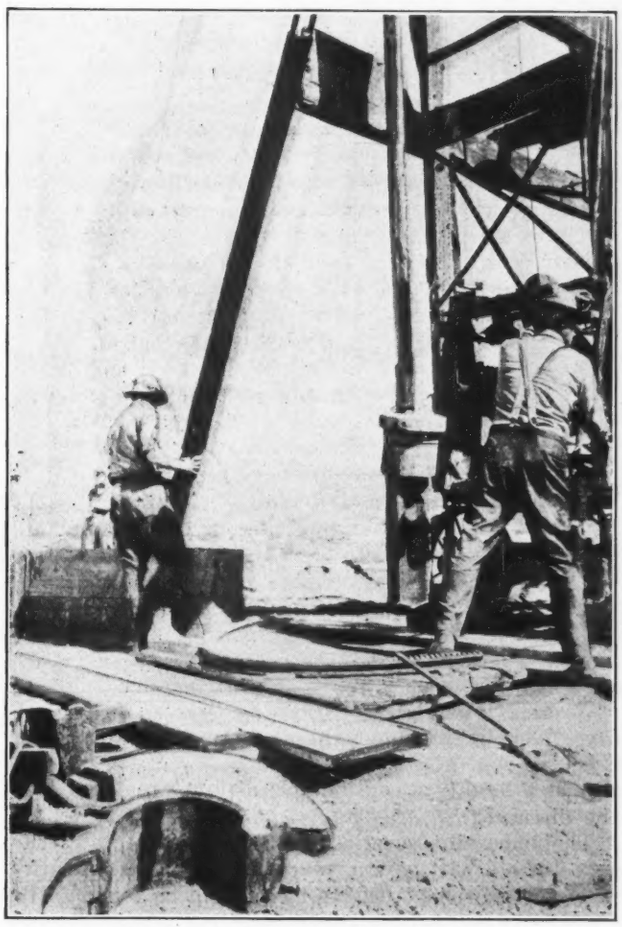
Prospecting for Oil at Fallon, Nev.

Tertiary Lake Beds in Vicinity of Stillwater Range Scene of Wildcat Drilling—Scanty Evidences Of Oil—Lake Beds Occur in Many Localities in Western Nevada—Few Indications of Oil Discovered

SAN FRANCISCO CORRESPONDENCE

FALLON, NEV., is the center for a number of companies which are prospecting for oil in Tertiary formations occurring at and close to the southwestern end of the Stillwater range east and southeast of Fallon. Present operations are distinctly of a wildcat nature, as no conclusive indications of the presence of oil in commercial quantities have yet been discovered. It is claimed that oil has been found in two wells, one being put down by the Fallon Oil & Gas Co. and the other on the George B. Williams ranch, by the Churchill County Oil & Gas Co. Over fifty-six companies have been formed or are in process of formation. Local business men, both in Fallon, Reno, and other Nevada localities, are principally interested, although a few from San Francisco have gone into the gamble. Apparently no important oil companies are interested in a direct way. A representative of the *Engineering and Mining Journal* visited the locality. Conditions at the rigs visited are as follows:

Silver State Consolidated Oil Co.—Portable well rig; down 90 ft., with a 12¾-in. casing. Claim an "oil shale," and a carbonaceous clay streak at 65 ft. Expect to drill 1,000 ft.



SILVER STATE CONSOLIDATED CO.'S RIG

WELL OF LAHONTON OIL SYNDICATE

Fallon Oil & Gas Co.—Portable rotary well rig; down 660 ft. Have cemented well and expect to resume drilling soon. Claim to have struck oil. No existing evidence at surface.

Weaver Oil Co.—Wooden derrick, portable rig; 300 ft. in depth. Still in wash.

Lahonton Oil Syndicate—Portable rig, wooden derrick,

350 ft. deep, 340 ft. 12½-in. casing. Claim to have struck first water, a 20 ft. water sand containing salt water. Still in surface wash.

Diamond Oil Co., southeast of Lahonton Oil Syndicate—Building derrick.

El Petrolia Development Co., Stillwater—Preparing to work. Small wooden building constructed.

Big Four Oil & Gas Co.—Building a wooden derrick.

Fallon Pioneer Oil Co.—Wooden derrick, portable rig; down 95 to 100 ft.

Wheeler Oil Syndicate—Wooden derrick, portable rig, down 360 ft.; cased 300 ft. Have struck a flow of hot water.

Churchill County Oil & Gas Co.—Portable rig; 12½-in. casing. Claim to have struck oil seepage.

Of the operations listed, all excepting the last two are close to the edge of the Stillwater range, they being out on the flat well away from the range. The Lahonton Oil Syndicate's well is on a small divide in a north-south valley between the Stillwater range and an outlying low range of hills. To the north the valley extends to Stillwater and to the south toward the depression formed by Four Mile and Eight Mile flats. The list of companies reported as drilling, or preparing to drill, or on the properties of which derricks have been erected, taken from a local compilation, is given in the table.

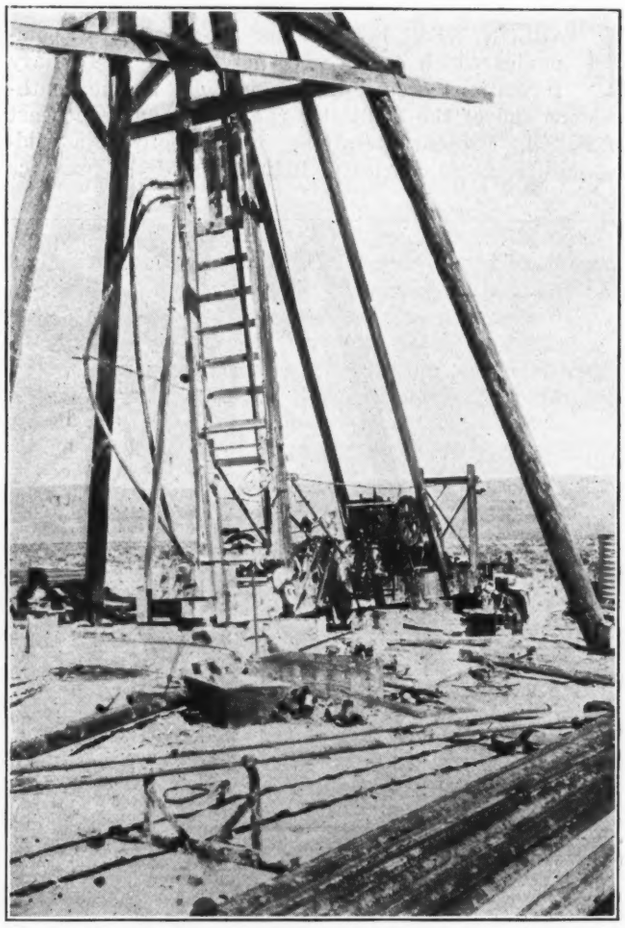
COMPANIES REPORTED AS PREPARING TO DRILL OR ON THE GROUND, AND WHICH HAVE ERECTED DERRICKS

	Township	Range
Fallon Oil & Gas Co.	18 N	31 E
Fallon Pioneer Oil & Gas Co.	19 N	32 E
Churchill County Oil & Gas Co.	19 N	29 E
Big Four Oil & Gas Co.	19 N	29 E
Diamond Oil Co.	18 N	31 E
Lahonton Oil Syndicate	18 N	31 E
Silver State Consolidated Oil Co.	18 N	31 E
Weaver Oil Co.	18 N	31 E
Wheeler Oil Syndicate	18 N	31 E
Carson Sink Oil Co.	17 N	28 E
Indian Lands Petroleum Co.	19 N	30 E
Paramount Oil & Gas Co.	18 N	31 E
Astra Development Co.	19 N	31 E
Ranier Oil Co.	20 N	32 E

Offices for the sale of stock in the various companies are plentiful, and the simple machinery for separating the money from the many to provide the wherewithal for financing the various companies appears to be working in the usual fashion, although one stock seller was heard to remark: "It's just a little bit dull, a little bit dull." Some of the promotion literature is decidedly misleading and contains the usual balderdash, such as "Read the report of an expert"; "Others have made millions—you can too"; "This is your big opportunity"; "See the point?" Nevertheless, there is discernible some degree of sincerity, and not all of the companies are merely selling stock. A fair proportion are legitimately spending money conclusively to test the oil possibilities of the locality.

In the *Nevada State Journal* of April 18 there appear three reports, one by E. P. Osgood, another by Lawrence W. Crehore, and the third by A. E. Wiley, all of which review the general possibilities of oil discovery in the Fallon district. There is a fourth article in the same paper by A. J. Moore. All of these reports are optimistic in tone, and there is much that savors of promotion in them. In the *Nevada Mining Press* of April 10, Charles F. Spilman has an article on "Oil Structure and Petroleum Gas Attract Operators to Fallon." In the same issue are two short articles, one by A. E. Wiley and another by Orlando D. Barton, both giving a crude idea of various geological features. Other articles of a news nature by A. J. Moore have appeared in the *Salt Lake Mining Review* of May 15 and May 30. A. L. Robinson is quoted in promotion circulars. By and large, the impression is created, at least in the minds of the unwary, that there are many favorable oil indications in the Fallon district.

To test opinion, six thoroughly qualified geologists, all of whom are taken as authorities in oil geology, were interviewed, and the question of whether geological conditions favored the occurrence of oil in western Nevada or not was put to them. Two geologists were not familiar with the field, and could give no positive opinion. Four were familiar with the field, and expressed doubt that oil would be found in commercial quantity. One of the four said that he had found some oil indications, one indication being the odor of oil at a water well in the district and the other a chloroform



ROTARY RIG, FALLON OIL & GAS CO.

test at a locality a considerable distance removed from the district.

The important question is not the incidental occurrence of oil, but its occurrence in commercial quantity. It is not improbable that some oil will be found in the Fallon district and in other localities where Tertiary lake beds are found.

Lake beds tentatively placed at different horizons in the Tertiary, the Pliocene, Miocene, Oligocene or Eocene, are in evidence at many points in western Nevada. The Truckee beds, west of Reno, the sedimentaries near Fallon, the area east of Mina, the Esmeralda formation, in the Silver Peak area, and west of this area; the Siebert formations at Tonopah and Goldfield, the Furnace Creek area, and an area in the Mohave Desert,

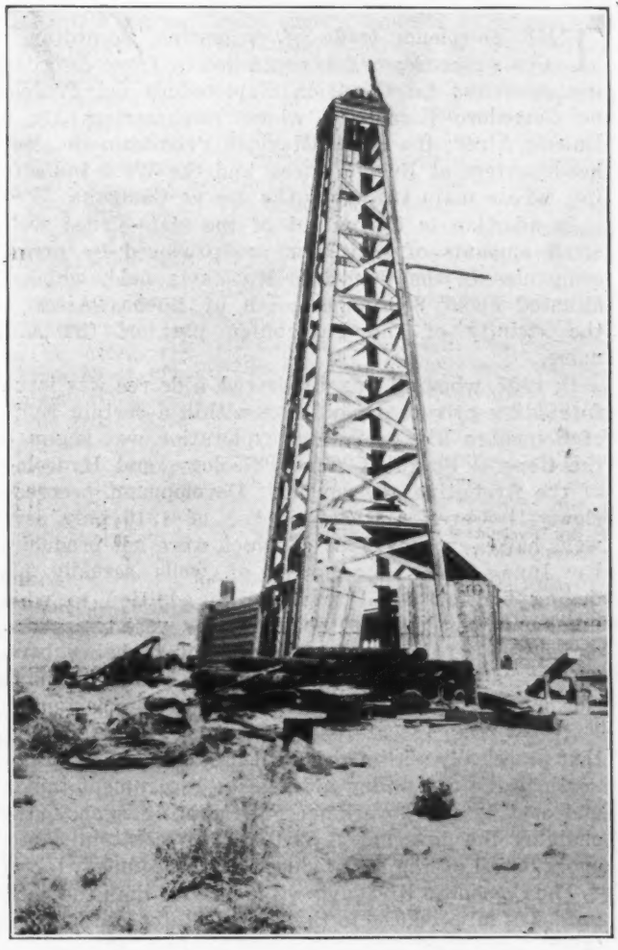
in California, are important localities of Tertiary lake sediments. The correlation of these occurrences has not been thoroughly demonstrated. The most extended résumé is given by F. L. Ransome in Professional Paper 66, p. 95, in his review of the work of King, Hague, Lindgren, Turner, Spurr, Ball, Gilbert, Fairbanks, and Campbell. Ransome says:

> There is in western Nevada extending from the 40th parallel down to about the 35th parallel, a chain of remnants of Tertiary lacustral deposits. These deposits are of great volume, estimates of total thickness in the various places where beds are well represented ranging from a minimum of at least 600 ft. (183 meters) at Tonopah to 14,800 ft. (4,511 meters) at Silver Peak. The materials vary from place to place, but are preponderantly volcanic. They include true tuffs, largely rhyolitic, and detrital rocks of a wide range of coarseness derived from all the prelacustrine rocks and probably also from volcanic masses piled up and eroded during the lake period. Diatomaceous beds appear to be rather characteristic of the deposits north of the Death Valley region, while in and south of Death Valley descriptions indicate a greater abundance of clays, with associated beds containing gypsum and borax. Lignitiferous beds, apparently in all cases in the basal part of the deposits, occur from Truckee River southward to the Mohave Desert. The beds are everywhere folded and faulted, and in many places sheets of basalt have flowed over their eroded edges. It is clear that since the period of lacustrine deposition, the region has undergone such deformation and erosion as to entirely remodel the topography; lake beds, for example, now forming the summit of Montezuma Peak, west of Goldfield.

Indications which favor the possible occurrence of oil in these formations are: the presence of diatomaceous beds, "oil shales" (not bearing oils but from which oil may possibly be obtained by distillation), combustible gas (whether marsh gas or derived from petroleum, not being clearly definable in all cases), and a few isolated tests of sedimentaries, which tests appear to show oil. In addition, oil has been reported in a few localities. A well put down in 1907-08, southwest of Reno, in the Truckee beds, reached a depth of 1,890 ft., and in the log (U. S. Geological Survey, Bulletin 381, p. 475), a blue shale showing a little oil was reported at a depth of 1,270 ft.; at 1,545 streaks of coal, and at 1,710 ft. blue shale and a little sand, with water and a little oil. No gas was struck in this well. The log of the Timberlake well, put down by the U. S. Geological Survey, includes indication of oil. To these may be added whatever oil occurrences have been encountered in the Fallon district, although these are susceptible of further proof.

The occurrence of thin lignitic beds at several horizons in the Truckee beds, in the Esmeralda and at other places, may or may not have significance. Robert Anderson, in Bulletin 380, U. S. Geological Survey, describes an occurrence of asphaltite in Eureka County, fifteen miles south of Palisade, in the Pinon range. The asphaltite exists as a filling in fractures within steeply dipping Carboniferous strata. Mr. Anderson says: "There is little doubt that strata in this region at one time contained considerable petroleum. Owing to disturbed conditions of the beds . . . it is likely that almost all, if not quite all, of such oil has escaped or become altered in the derived form of asphalt. Strata of probable Paleozoic age elsewhere in this portion of Nevada are reported to be petroliferous, and it is not impossible that careful study might reveal areas in which conditions are more favorable than in the one here discussed." This occurrence is not of importance with respect to the Fallon area, but is mentioned as having a bearing on the subject of oil possibilities in the Great Basin region.

On the other hand, the fact that the sedimentaries belong to a fresh-water series, and not to readily defined marine strata, may be taken as unfavorable. The occurrence of the diatomaceous beds at upper instead of lower horizons is looked upon by some geologists as unfavorable. The fact that the diatomaceous beds are in many instances intercalated with beds of volcanic ash, and that there exists in the diatomaceous beds often a large proportion of contemporaneous ash and glass, is considered unfavorable. The paucity of organic life and the prevailing volcanism accompanying or preceding sedimentation are other unfavorable factors. Faulting is conspicuous in the occurrences of these lake beds. Despite many exposures of tilted strata, there have been surprisingly few discoveries of seepages and other well-known forms of surface indications of the presence of petroleum.



DERRICK USED WITH ROTARY RIG

On the whole, the unfavorable overbalance the favorable factors, but it is worth while to prove or to disprove conclusively the commercial oil possibilities of the Tertiary lake beds. In the present activity at Fallon there is an excellent opportunity for co-operative work. Little will be gained by indefinitely multiplying companies or in farming the public for money which may be uselessly spent. Let the companies which have started

wells push a sufficient number to a depth to prove the presence or absence of oil in commercial quantity. Let them prorate the expense for this work in an equitable way. They will best serve their own and conserve their stockholders' money by this procedure. If they are successful—and everyone wishes for their success—they will have the satisfaction of knowing that they have extended greatly the productive oil areas of the country.

Comodoro Rivadavia Field, Argentina

State Has Practically a Monopoly on All Oil Produced—Oil Discoveries in Other Sections

THE petroleum trade of Argentina, according to *Commerce Reports*, is controlled by three distributing agencies: La Comisiôn Explotadora del Petróleo de Comodoro Rivadavia, whose headquarters are at Buenos Aires; the Anglo Mexican Petroleum Co., with headquarters at Buenos Aires, and the West India Oil Co., whose main storage tanks are at Campana.

In addition to the output of the state-owned wells, small amounts of petroleum are produced by private companies in the Comodoro Rivadavia field, which is situated about 850 miles south of Buenos Aires, in the vicinity of the Patagonian port of the same name.

In 1907, when oil was discovered, a decree was issued forbidding private exploitation within a certain radius of Comodoro Rivadavia, and exploration was begun by the General Board of Mines, Geology, and Hydrology of the Argentine government. Development proceeded slowly, however, and by the end of 1910 only seven wells had been sunk, four of which were not producing. By June, 1918, the number of wells actually producing had increased to forty, in addition to which number fifteen had been abandoned or were temporarily closed for repairs, and twenty-one were being bored. The operations of the several private companies in the Comodoro Rivadavia field are still largely experimental. Extracts from recent reports of these companies show that practically all the oil which they produce is shipped north to the consuming markets in government tankers and sold by the government distributing agency, thus enabling the government virtually to maintain a monopoly on all of the oil produced in the country.

The Comodoro Rivadavia oil is heavier than the better grades of oil produced in the United States and has heretofore been used almost entirely as fuel, although the statement has been made that it will distill readily. It has an asphalt base and a specific gravity ranging from 0.922 to 0.940, according to the U. S. Geological Survey, and on distillation yields 1.5 to 3.5 per cent of naphtha and gasoline, 15 to 19 per cent of illuminating oils, and 77 to 85 per cent of lubricants, fuel, and coke.

Oil has been discovered in three sections of Argentina besides the Comodoro Rivadavia field. One of these deposits, known as the Salta Jujuy field, is in the Provinces of Salta and Jujuy near the Bolivian border, and is entirely inaccessible at present except over the long, single-track government railway from Tucuman north to the Bolivian border. Another of these deposits, known as the Cacheuta field, is a few miles southwest of Mendoza, near the Chilean border. The third is the Neuquen field, where the government is planning to undertake some exploration work during the present year. This last is considered the most promising of the three fields.

Wells Drilled Near San Diego, Cal.

A number of wells that were carried to depths of more than a thousand feet have been drilled around San Diego, according to the U. S. Geological Survey. One of the first of these wells was the Chula Vista oil well, which reached a depth of 1,812 ft. without striking oil. A few years ago a deep well was put down on the south side of Otay Valley by the Otay Oil Co. About the same time the Lo Tengo Oil Co. sank a well 3,400 ft. deep on the south side of Otay Mesa. Both these wells afforded showings of oil and gas. The Tia Juana well, which was lately taken over by the Community Oil Co., went 1,405 ft. without encountering oil except a questionable show.

Two wells were put down by the San Elijo Oil Co. at Sorrento. The first well was sunk 1,599 ft., the second 1,303 ft. Oil and gas are reported to have been noted in both wells. The Puterbaugh well, at Morena, is reported to have gone 1,200 ft. without affording encouraging results. The Clark well, about five miles northeast of Encinitas, in Sec. 26-12-4, penetrated Eocene strata for 2,125 ft. without showing any satisfactory indications of oil.

A well recently abandoned was the Balboa, in Mission Valley, which was drilled to a depth of 5,625 ft. This well disclosed the interesting fact that sedimentary beds more than a mile thick underlie this part of San Diego County. The greater part of these beds belongs to the Cretaceous system, but whether they lie approximately flat, as do the overlying Eocene beds, has not been determined. Possibly they are somewhat folded, so that the distance drilled is more than the actual thickness of the beds.

Mexican Pipe Lines Nearing Completion

The Mexican Gulf Co.'s 10-in. pipe line from the lower Tepetate fields to its terminal at Prieto, a distance of sixty-five miles, is nine-tenths completed, according to the July issue of *Oil Trade Journal*. The line parallels its 8-in. line, which covers the same distance. In addition, the company has completed two 8-in. lines from Tepetate to Los Naranjos, giving a continuous run from the Prieto terminal to Los Naranjos. There is also being built a 10-in. line from Tepetate to Tolteca and an 8-in. line from Los Naranjos to Lot 146, Amatlan district. Four temporary pumping stations will soon be finished.

With the construction of the pumping station at Prieto the company will have a loading facility of 7,500 bbl. an hour. By July, according to an official, deliveries in Tampico should be at the rate of 2,000,000 bbl. of oil a month, for which there will be facilities for exporting.

The Huasteca Petroleum Co.'s new 10-in. pipe line from Tampico to Cerro Azul, a distance of sixty-five miles, is expected to be completed by Aug. 1. Twenty-five miles have already been laid and the pipe has been distributed along the way for about sixteen miles in addition.

NEWS FROM THE OIL FIELDS

Storms Damage Properties in Burkburnett Field

Texas Company Building Houses for Employees—Other Activities from Texas Districts

From Our Special Correspondent

Lightning struck a big oil tank of the Texas Pipe Line Co. in the Burkburnett field recently, igniting the contents. The loss was complete. Two bad storms also blew down many derricks. In spite of this, however, the production increased 5,000 bbl.

At Port Arthur, the Texas Co. has begun to solve the housing problem of its employees. It has purchased 100 residence lots in one of the better sections of the city, and has started to build twenty houses for office employees. More will be added later. In another section of the town the first unit of forty-two houses for Mexican workmen has been completed. These are three or four-room houses, with modern conveniences. This Mexican settlement will cover three city blocks, and will contain community centers as well as the dwelling houses.

A new well being drilled by the Republic Production Co. in the Breckenridge field, Stephens County, recently blew the tools out of the well and damaged the casing. Gas at the rate of 10,000,000 cu.ft. daily went to waste, and the initial flow of oil was over 2,000 bbl. daily, it was reported. The casing is so badly damaged that it is doubtful if the hole can be cleaned. Just north of Breckenridge, the Humble Oil & Refining Co. has brought in a well on the Dickey tract, flowing by heads. As the sand has barely been penetrated, it is believed the well would make a much larger production if drilled deeper, but the pipe-line facilities are not sufficiently large to handle any more oil at present. The No. 3 well of the Oklahoma Petroleum Co., on the Walker-Caldwell land, three miles east of Breckenridge, has made a head of oil. The well will be drilled deeper.

Deep drilling on the southern Gulf Coast section is being done by the Kleeberg County Oil & Gas Co. in its No. 2 Ross well, now below 3,600 ft. It is also reported that the No. 1 Champion well of the Grande & Gulf Oil Co., twenty miles north of Brownsville, Cameron County, will be sunk to a depth of 7,000 ft. if oil is not found before that depth is reached. The well is now 2,000 ft. deep.

In Brazoria County several new wildcat wells are being sunk east and northeast of Angleton. Gas in water wells in this section was discovered several years ago. In this same county, at Stratton Ridge, the Freeport Sulphur Co., Humble Oil & Refining Co., Texas Co, and others still continue to drill wildcat wells. West Columbia, in this county, still continues to make the largest oil production of the coastal domes.

At Goose Creek, Harris County, the daily production during the week ended July 10 increased to 17,000 bbl., compared with about 15,000 bbl. during the preceding week.

Natural Gas Production Figures

From Our Washington Correspondent

The U. S. Geological Survey has just reported the 1918 production and consumption figures for natural gas. These figures show that a little over 720 billion cu.ft. was produced and marketed that year. The value of this production at 21¼c. per M. is a little over $153,000,000. As usual, West Virginia, Oklahoma, Pennsylvania, and Ohio lead in the production, ranking in the order named. Pennsylvania, Ohio, West Virginia, and Oklahoma is the order of consumption, showing, as usual, the large export of gas from West Virginia to Pennsylvania and Ohio, and the considerable exports from Oklahoma to Kansas and adjacent territory.

There is a wide range in the average price at which natural gas is sold by the producer in various parts of the country. The figure for Wyoming is 3.59c. per M.; in New York 67.05c., and Michigan 89.08c.

There is a decided tendency toward an increase in the percentage of gas sold for domestic users and a corresponding decrease in the percentage used industrially. This is in line with the recommendations of the Conservation Commission which has recently been studying the subject, the natural result of the gradual increase in the price at which gas is sold tending to make its use industrially less advantageous than formerly. This report shows that the 7,100 producers supplied 2,500,000 domestic consumers and 16,500 industrial consumers. The average price paid by the former group is 31.35c. per M. and the latter 15.23c. The total volume of gas used industrially is, however, still considerably greater than that consumed in domestic equipment, amounting to about 60 per cent of the total. Of this manufacturing takes slightly more than the production of industrial power.

Although about 30 per cent of the wells drilled in 1918 were dry the total number of wells productive at the end of the year had increased by about 1,000 over the number productive at the beginning of the year. The total productive Dec. 31, 1918, was 40,369.

The discovery of oil in Southern and Southwestern Alaska has been reported, and it is stated that 35,000 acres has been filed upon by prospectors.

Operators Leaving Lee County, Ky.

Activities Transferred to Other Oil Sections of the State—Eastern Districts Expect Development

From Our Special Correspondent

A movement of oil operators from the Lee County fields to Johnson, Magoffin, Morgan, and others of the more eastern counties of Kentucky is beginning, according to oil men returning from that district. They report that the frenzy of development there is over, and almost every train carries away one or two drilling rigs to Paintsville, county seat of Johnson County, and other points in that region. The wells in these eastern counties are the deepest in the state, none finishing short of 1,500 ft., and the production is from a "second sand."

Two important transactions have taken place in the eastern territory. A tract of 500 acres, with two producing wells, averaging 30 bbl. each, was sold for $350,000. Another tract of 90 acres, with one producing well, good for 50 bbl., sold for $90,000. The latter is considered an exceptionally high price. Both tracts are in Johnson County. The purchaser is not known, but is understood to be one of the larger oil companies. Considerable development is anticipated in consequence.

In Warren County, M. Roulen, of Paris, France, has drilled in a large producing well on the Kirby farm. He has put up three 250-bbl. tanks and two 100-bbl. tanks for the output, and is running two machines which are drilling Nos. 2 and 3 A modern pumping house has been installed.

No. 5 on the Wainscott lease in Allen County is reported completed at 321 ft., 80 ft. under the shale. It is rated at 200 bbl. flush production.

Gas Shortage Predicted in Oklahoma

From Our Special Correspondent

Warning has been sounded by the Oklahoma Gas & Electric Co., of Oklahoma City, Okla., to the public to make preparations for a fuel supply during the "gasless" months next winter or there will be greater suffering than in 1919. Gas companies throughout the state have launched propaganda campaigns to this effect, but so far to little avail.

The Frantz Corporation is preparing to sink a test well about nine miles northeast of Boulder, Col. The company's geologists anticipate that oil will be found at a depth of 2,500 to 3,000 ft. Leases on several sections of land have been secured by the company, and drilling equipment is being assembled.

COURT DECISIONS IN MINING CASES

By Wellington Gustin

PENNSYLVANIA

Copper Process Co. Loses Bond Suit

Judgment of Lower Court Sustained—Parties Accused of Fraud and Connivance by Bonding Company

Judgment against the Copper Process Co. in its five actions against the Chicago Bonding and Insurance Co., rendered in the U. S. District Court for the Eastern District of Pennsylvania, has been affirmed in the Court of Appeals, Third Circuit. The actions were on five bonds of the defendant company, each for $52,400, given the copper company to assure performance by the Bird Coal & Iron Co. of five contracts for the sale and delivery of pig iron.

The record in the case is voluminous. Each contract, as set out by the Copper company, provides for the purchase by it and the sale by the Iron company of 4.000 tons of Talladega pig iron of a given analysis during a given month at the price of $13.10 per ton delivered f.o.b. Talladega, Ala. The defendant pleaded two defenses, and introduced evidence tending to show (1) that its indemnity bonds did not cover contracts for purchase monthly of 4,000 tons of pig iron at $13.10, but for the purchase monthly of 2,000 tons at $26.20, and that the contracts covering 4,000 tons at $13.10 had been substituted; (2) that it was induced to enter into the bonds by fraud of the Iron company with the knowledge and connivance of the Copper company.

That it was induced to enter into its undertakings by fraud and gross misrepresentations of the Iron company was not seriously disputed by the Copper company, whose position was that it was not a party to the fraud and was ignorant of it.

The substance of defendant's testimony was that the Copper company was not at any time concerned in any business other than its transactions with the Iron company; and that the Iron company had as its one asset an interest in an option or arrangement with Ladenburg, Thalman & Co., of New York, for the operation of a blast furnace at Talladega, Ala., which had long been out of use. When the Iron company was practically without funds or tangible assets, it entered into the five contracts at $13.10 a ton, a price in the Birmingham district, little, if any, above the cost of production. With these contracts made, the two companies entered into another contract, called the "Underlying Agreement," reciting the five contracts and providing for an advance or payment by the Copper company to the Iron company of $75,000, with numerous other details. The curious feature of this agreement was that it contained no provision for the return or repayment to the Copper company of the money so advanced.

To induce the bonding company to enter into the bonds, an officer of the Iron company supplied defendant with certified copies of what purported to be its pig-iron contracts with the Copper company, but not for 4,000 tons a month at the suspiciously low price of $13.10 a ton, as actually called for by the contracts, but 2,000 tons a month at $26.20 a ton, or about market price. Defendant's agent was shown what purported to be an engineer's report of the property, and an inventory and a financial statement of the Iron company. He was informed that the Iron company had $75,000 to its credit, verified by letter from the depository bank, which was represented as money from the sale of stock; that it owned 2,511.5 acres of ore land; and possessed total assets of $1,360,650.

When the transactions were reported to its home office within a few weeks, it immediately made disclaimer, this being about May 1. The Iron company breached its first contract in June; in fact, it delivered no iron under any of the five contracts. There was evidence that the two companies were controlled by the same officers, that the president of the Copper company assumed control of the funds of the Iron company on its failure to perform its sales contracts; stopped payment on checks at will; controlled its directorate by his nominees; and in July and August caused it to vote for his protection a bond issue of $500,000 and notes to the amount of $750,000.

The questions of fact were presented to the jury, which found against the Copper company, upholding contentions of the defendant, and judgment was rendered accordingly, and this was affirmed on appeal.

KENTUCKY

Virginia Iron Loses Suit To Quiet Title to Mineral Lands

The decree for A. S. Webb and G. B. Hoppin, defendants in the suit brought against them by the Virginia Iron, Coal & Coke Co. to quiet title to the minerals underlying certain parcels of land in Perry County, Ky., has been affirmed by the United States Circuit Court of Appeals for the Sixth Circuit. This court held that a grantee of mineral lands was charged with constructive notice of the rights of other persons then in possession of and living on the land and claiming under deeds without mineral reservations, which were recorded, to the extent of the boundaries in such deeds.

ARIZONA

Judgment Against Calumet & Arizona Reversed

Facts Held to Establish Contributory Negligence of Deceased Employee of the Company

On its appeal to the Supreme Court of Arizona, the Calumet & Arizona Mining Co. has secured from that court a reversal of the judgment rendered against it for death of its former employee, Jesse Gardner, in its smelter at Douglas, Ariz. The case has been remanded to the trial court, with directions to that court to dismiss the action.

In its opinion, the court lays down the measure of damages for death of an adult son, where death is caused by negligence of the employer, as being the reasonable expectation of the parent of pecuniary benefit from the son had the son lived. Where the workman, experienced and skilled in handling electric switches in controlling machinery for pouring copper and skimming the slag, is killed when he reached for a switch safety handle without looking, and grasped a live blade, the court held the company entitled to a verdict, on the ground that deceased was guilty of contributory negligence, for which, under the conditions, the company properly could not be held responsible.

CALIFORNIA

Calaveras Copper Co. Must Pay Compensation

Andy Jordan Held by California Supreme Court To Be Acting Within Scope of His Employment

The Supreme Court of California has denied a hearing to the Calaveras Copper Co. in its petition to reverse the award of compensation made to Andy Jordan, an employee, under the Workmen's Compensation Act, thus making the award for the injuries sustained by Jordan final.

Jordan was employed by the copper company as a truck driver about its property at Copperopolis, Cal., and at the date of the injury had been instructed to do some hauling for one of the company officials. In order to haul a bigger load, Jordan concluded to put additional sideboards on the truck, and to secure the materials he went to the company's saw mill and started a ripsaw. Here he was injured by the ripsaw. The company contended that Jordan was injured while acting outside of his scope of employment and thereby not entitled to compensation, but the court held that his injury resulted from causes incident to his employment.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

Joint Conference Committee of F. A. E. S. Clears Up Some Points

Object, Name, Representation, Finances and Machinery Are Discussed in Some Detail

OBJECT OF FEDERATION

The object of The Federated American Engineering Societies as declared in its Constitution, and as has been repeatedly stated,

> "Shall be to further the public welfare wherever technical knowledge and engineering experience are involved and to consider and act upon matters of common concern to the engineering and allied technical professions."

Notwithstanding this, the statement is repeatedly made that the organization does not deal with the interests of the individual engineer and of the allied technologists. The purpose of the organization is that of service first to the nation, state and community, and second, to the profession, which obviously must include the interests of the individual. While it is true that it does not deal with the interests of the engineer and technologist as does a labor union for its member, nevertheless its work will do more ultimately to advance the interests of the individual than a labor union could possibly do, because the advancement of the profession through a greater recognition by the public of the engineer and allied technologist, and the greatly increased solidarity and higher standards of these professions, must unquestionably work for their ultimate good.

NOT A NEW ORGANIZATION

The Joint Conference Committee, among others, has referred to The Federated American Engineering Societies as a "new" organization. This is not strictly correct. While the name is new, the organization will be a successor to the existing Engineering Council, whose work will be amplified and carried on on a much more extended plan as to scope and membership.

HOW AND WHY THE NAME WAS SELECTED

There has been considerable comment on the name of the new organization. Probably no detail caused the Committee on Constitution and By-Laws of the Organizing Conference more serious thought than the question of a suitable name. The purpose was to secure a short title that could readily be used, and many suggested names were rejected for good and sufficient reasons. The Committee decided that the name of the organization should be indicative of its character, based on the fundamental resolution of the Organizing Conference, that it should consist of societies and not of individual members. The words "Association," "Confederation," "Federation," and others were suggested and considered and all were rejected and finally as a compromise the word "Federated" was unanimously agreed to. In view of the fact that other countries are looking with interest on this movement with the probability that there will be similar organizations formed in those countries, it was felt desirable that some distinctive name should be given the organization in this country, and so the word "American" was inserted. Objection to this was made on the ground that this country is the "United States of America" but the answer was that the soldiers of this country fought in Europe as "The American Expeditionary Forces" and have been internationally so recognized. It was thought undesirable to use so long a name as Engineering and Allied Technical Societies, especially in view of the fact that engineering as defined in the preamble of the Constitution is an all-inclusive word, and it was, therefore, decided to use only the word "Engineering" in the title. Hence the name "The Federated American Engineering Societies."

It is probable however, that when the organization begins to function it will be referred to rarely as The Federated American Engineering Societies but will be called the American Engineering Council which is the executive body of the organization.

BASIS OF REPRESENTATION

There seems to be difficulty in understanding what the basis of representation should be where a state organization exists and where there are also strong local organizations and affiliations. The Constitution provides that a state council or organization, representative of the engineers and allied technologists in the state, can be represented on the American Engineering Council on the basis of all the engineers and allied technologists in the state. If, however, there exists a strong local organization or affiliation which elects to have its own representative or representatives on the Council, then the state council or organization is entitled to representation on the basis of all the engineers and allied technologists in the state, less the engineers and technologists that are to be represented through their local organization or affiliation. This will not prevent the local organization or affiliation from participating in the work of the state council or organization in the consideration of matters affecting the state only.

NO PROVISION FOR DUES

The Joint Conference Committee has received several letters inquiring as to the provisions for dues. The Constitution and By-Laws provide for funds contributed by the Member-Societies for the support of The Federated American Engineering Societies. Inasmuch as it would be unreasonable for a small local society to pay as large a contribution as a national society, the Constitution provides that the contribution shall be on the basis of the number of members in the organization at the rate of $1.50 per member for national societies and $1 per member for local, state and regional organizations or affiliations. The individual, therefore, does not directly pay any dues but the Member-Society of which he is a member contributes to the support of The Federated American Engineering Societies on a per capita basis of its membership. It, therefore, follows that any one who is a member of several organizations which hold membership in The Federated American Engineering Societies will be counted in the total membership of each society as a basis of its contribution.

ORGANIZATION NOT CUMBERSOME

It has also been stated that "the machinery proposed is somewhat elaborate and appears to be cumbersome and expensive." The Joint Conference Committee can see no basis for this statement. The By-Laws provide that

> "Any Society or organization of the engineering or allied technical professions whose chief object is the advancement of the knowledge and practice of engineering or the application of allied sciences and which is not organized for commercial purposes, is eligible for membership."

The Federated American Engineering Societies will function through the American Engineering Council, which will meet either annually, or biannually, as it will determine. This American Engineering Council will consist of representatives from the Member-Societies on the basis of one representative for from 100 to 1,000 members and an additional representative for each additional 1,000 members or major fraction thereof. From this body of representatives will be formed an Executive Board of thirty, consisting of six officers and twenty-four other members selected in part from the national societies and the remainder from the local, state or regional organizations or affiliations. The plan reported by the Committee on Constitution and By-Laws provided that the representation on the Executive Board

should be based on the ratio of the total number of members in the national societies to the total number of members in the local, state and regional organizations or affiliations. The Organizing Conference however changed this to the ratio of the number of representatives from the national societies to the number of representatives from the local, state and regional organizations or affiliations, on the American Engineering Council. This Executive Board will meet monthly or as often as may be found to be necessary to properly transact the business of The American Engineering Council. There will be an executive officer who will also be the secretary of these bodies and who will be entrusted with carrying out their instructions.

As a matter of fact, the American Engineering Council thus created is less cumbersome or unworkable than the present Engineering Council; furthermore it has the distinct advantage of being more democratic and broader in its scope and membership.

ORGANIZATION CONSERVATIVELY FINANCED

As to the statement that the organization is expensive, it is pointed out that on the basis of the present membership of Engineering Council the income from the contributions provided in the Constitution of The Federated American Engineering Societies would be about $75,000. At no time in the history of its existence has the budget of Engineering Council exceeded $50,000. Provision is made, however, that

> "The Executive Board shall, whenever practicable, provide for the whole or a part of the expense of members or of representatives attending its own meetings and those of the Council."

On the basis of past experience, it is estimated that if the expenses of all the representatives on American Engineering Council and of the members of its Executive Board were paid to each meeting of these bodies, there would be involved an annual expense of about $25,000. The purpose of these expenditures was to secure a full attendance of the representatives of The American Engineering Council and of the Executive Board, especially during the earlier years of the organization. As will be noted in the excerpt from the Constitution the expenses of representatives of the Council and members of the Executive Board will be provided from such funds as may be available. If, in the judgment of the Executive Board, this money should be required for more urgent work, the expenses of the representatives and members would not be provided for. It seems to the Joint Conference Committee that it would be highly desirable to have sufficient funds to pay the expenses of this representative body of men who contribute their time for the good of the engineering and allied technical professions. The payment of these expenses is the only part of the organization that can be said to be expensive.

ORGANIZATION DEMOCRATIC

It has also been stated that the form of organization that has been set up is "autocratic, not democratic."

If a democratic organization is taken to mean one in which its constituents have a voice in its affairs, then the Federated American Engineering Societies is truly a democratic organization. Member-Societies of this organization are represented on the American Engineering Council, which has full power to control and to direct the activities of the American Engineering Council and of its Executive Board and can determine whether it is necessary for the former to meet annually, biannually, or tri-annually, or how frequently the latter shall meet.

THE OPPORTUNITY

The Joint Conference Committee is unqualifiedly of the opinion that an opportunity has been created for bringing about a solidarity of the engineering and allied technical professions that has never heretofore been available and that the success of the movement will depend on the whole-hearted support of each American engineer and of each technologist, who, if determined that this movement shall succeed, will obviously not bother with the details or the form of organization, in his effort to secure the end desired.

The First Citizen of America

The Manchester Guardian (England) said recently, referring to the Presidential nominations in the United States: "It is impossible for European observers of the American scene to refrain from speculating upon the profoundly significant difference that would have been made in the outlook had either of the two great parties bestowed the Presidential nomination upon the one great American citizen, apart from President Wilson, whose name is familiar to the whole world. There are millions of America's well wishers in Europe today who will ask with keen interest and deep concern: 'What is to be the decision of that great body of instructed, earnest American opinion, of which Herbert Hoover was the chosen leader?' "

Mining Engineers at the Conventions

Probably there were a number of mining men in attendance at the great Presidential nominating conventions; so far three have come to the knowledge of the *Engineering and Mining Journal.* Among the delegates to the Republican Convention at Chicago were O. C. Davidson, general superintendent of the Oliver Iron Mining Co., from the Twelfth Michigan District, and John C. Greenway, general manager of the Calumet & Arizona Mining Co., of Arizona. Among the delegates to the Democratic Convention is C. H. Benedict, of Lake Linden, Mich., mill metallurgist of Calumet & Hecla Mining Co.

Madagascar's Graphite Industry Growing Since 1914

Madagascar's graphite deposits are very numerous and are marked by lines of outcrop running eastward to the center of the island pretty much throughout its length, from Cape Amber on the north to Fort Dauphin in the south.

Madagascar graphite is much sought after for metallurgical crucibles because of the following properties: It has a very high carbon content; its flakey texture gives the crucible a woodlike structure, yet increases its strength and prevents cracking; the iron and silica contents are very low. In fact this graphite should prove a desirable substitute for the best Ceylon graphite, according to *Écho des Mines et de la Métallurgie*, Paris.

During the period between the beginning of rational exploitation of the Madagascar deposits in 1905 and the year 1913, the exploiters sought to perfect concentrating machinery, but the consumers of graphite were not familiar with the Madagascar article and it proved very difficult to bring them to appreciate its true value. Therefore progress had been slow; but the great demand and consumption induced by the war made it possible to perfect the mining and preparative methods and made the product better known. In 1917 35,000 tons (metric) were produced on the island and 26,000 tons were exported; in 1918 the exports fell to 16,000 tons by reason of the halt in transportation means during August and the complete cutting off of the American market. Otherwise the 1918 production would have amounted easily to 50,000 tons.

A study of the Madagascar graphite deposits and industry was contributed by Mr. Lavila to the *Bulletin Économique de Madagascar et Dependences, 1919*, giving in considerable detail the exploitation, treatment, and mechanical concentration by dry and by wet methods, by electrostatic separators, and by oil flotation.

Breakfast by French Engineers

The officers of the Féderation des Ingénieures gave a breakfast on June 19 at Langer's to their colleagues and friends in the French Parliament and to the directors of the great schools of civil enginering, says a report in *L'Écho des Mines et de la Métallurgie.* During the dessert M. Paul Petit, one of the presidents, set forth the origin, the purposes, and the aspirations of the Féderation, which now embraces more than 10,000 engineers. The dean of the Senate, by seniority, M. Denis, replied by praising the advantages of the organization; and M. Bochet, director of the École Centrale, congratulated the country on the lively interest shown by the great engineering associations in the moulding of their young colleagues and in the part they are summoned to take in the economy of the industrial and social future of France.

Technical Papers

Use of Oil Fuel.—The July number of *Industrial Management* (120 W. 32 St., New York, 35c.) contains an article entitled "The Efficient Burning of Fuel Oil, a Summary of Good Practice." Many engineers are shifting from coal to oil burning. Too often the fireman thinks that all that is necessary is to turn on the oil valve and admit enough air to prevent heavy smoke. This article points out some of the things which must be watched to secure maximum economy. The oil should be filtered through about 40 mesh and heated to about 125 deg. F. for steam- or air-type burners, and to 150 deg. for mechanical burners. Air for combustion should be regulated by the damper or blower and the ash-pit doors left wide open. The oil pressure depends on the type of burner: about 30 to 50 lb. for steam-jet burners and 100 to 150 lb. for mechanical pressure burners. Several types of burners are described; rotary burners are coming more and more into use; 200 to 350 lb. of oil per burner hour are commonly used in stationary practice. A well-constructed furnace and proper care of burners are essential to the best work.

Helium—The Mines Branch of the Department of Mines, Canada (Dr. Eugene Haanel, Director, Ottawa), has issued a "Report on Some Sources of Helium in the British Empire," by J. C. McLennan and associates. The report covers investigations made of the helium content of various natural gas supplies in Canada, where, it is stated, the largest sources of supply in the empire are available. Experiments on a semi-commercial scale were made, followed by the working out of the technical details in connection with large-scale production and purification of helium. It is estimated that the gas can be produced at less than 25c. per cu.ft. at normal pressure and temperature. The natural gases of Ontario, Alberta, and British Columbia were examined.

Safety Lamps—Although written primarily for use in the trade-extension classes organized in coal-mining communities, "Safety Lamps," (Bulletin No. 42, Trade and Industrial Series No. 12, issued by the Federal Board for Vocational Education), will be found suggestive for discussion purposes and instruction in the metal-mining field. The principles of safety lamps, construction, and requirements are detailed, with descriptions of the various types.

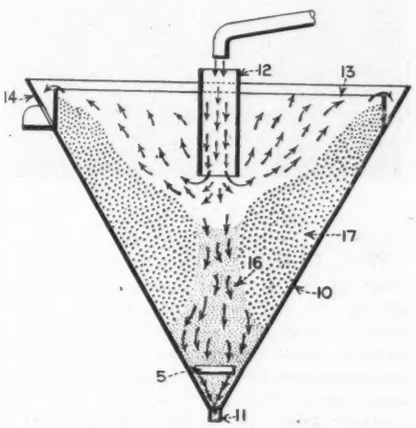
Mine Safety Standards—Bulletin No. 9 of the Colorado Bureau of Mines includes a number of rules dealing with the above-named subject. Although the standards contain nothing new, and in general follow the rulings outlined by most operating mining companies, it is commendable that the state has placed its sanction on the work that is being done in accident prevention. Many of the standards are applicable to quarries, mills, and smelters as well as to mines.

Talc and Soapstone—A list of some 79 uses for these materials is contained in a 9-page pamphlet of the U. S. Bureau of Mines *Reports of Investigations* series, for May.

Recent Patents

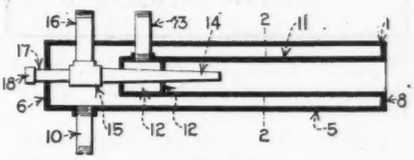
1,339,682. Settling-Basin Separating Device. Charles Allen, El Paso, Tex. Filed July 3, 1917.

A method of preventing irregularity in the discharge of solid particles through the outlet orifice of a dewatering settler adapted to accumulate a substantial bulk of settled material which consists in filling the space centrally above the orifice and below the level of the settled material in a manner to leave an attenuated passage for the settling solids extending from and above the discharge orifice for an appreciable distance.



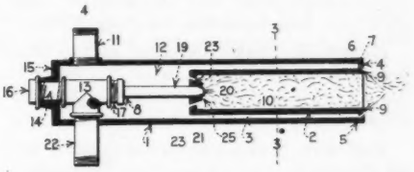
1,339,580. Combustion-Gas and Crude-Oil Burner. Benjamin F. Runyan, Houston, Tex. Filed Sept. 6, 1919.

A burner comprising a pressure fluid casing open at one end, a combustion casing open at one end, having a plurality of atomizing apertures, said combustion casing being disposed within the fluid pressure casing and connected at its open end to the fluid pressure casing, the remainder of the combustion casing being spaced from the inner walls and end of the pressure fluid casing, a pressure fluid inlet member communicating with the pressure fluid casing adjacent its closed end, an oil inlet member extending through the pressure fluid casing diametrically opposite the pressure fluid inlet, a nozzle carried by said oil inlet member, said nozzle extending through the end of the combustion casing, a perforated plate surrounding the nozzle within the combustion chamber adjacent the closed end thereof, said plate co-operating with said closed end to form a gas chamber, and a gas inlet extending through said pressure fluid casing and into the gas chamber.



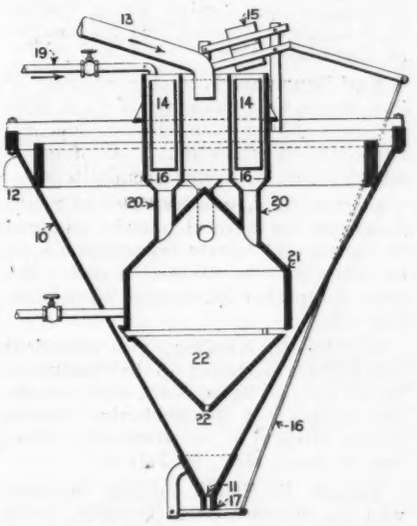
1,339,579. Crude-Oil Burner. Benjamin F. Runyan, Houston, Tex., assignor of one-half to Joseph O'Donnell Decuir, Houston, Tex. Filed June 25, 1919.

In a crude-oil burner, the combination with a casing having steam and oil chambers and provided with a mixing chamber, of means adjacent the opposite ends of the mixing chamber for spraying the oil and the combined oil and steam at angles toward each other, whereby the sprays may impinge at a point tangentially to the oil spray.



1,339,684. Slime-Pulp Thickener. Charles Allen, El Paso, Tex. Original application filed June 9, 1917. Divided and this application filed Oct. 5, 1918.

In a thickener for slime pulp, a settling tank having a controllable orifice for the discharge of thickened material, a fluid column in hydrostatic balance with the thickening material and adapted to contain fluid of fixed density whereby variations in the density of the thickening material will cause a change in the elevation of the fluid in said column, means actuated by the rise and fall of the height of the fluid in said column to control the sizes of the discharge orifice, and a cone-shaped baffle member at the bottom of the fluid chamber overlying the discharge orifice for the purpose mentioned.



MEN YOU SHOULD KNOW ABOUT

Sidney Paige has gone to South Dakota to continue his study of the Homestake orebody.

Lewis A. Levensaler, mining engineer, has opened offices at Suite No. 902, Hoge Building, Seattle, Wash.

C. M. Weld, mining engineer of New York City, is in West Virginia for a fortnight on professional business.

Philip S. Smith, administrative geologist of the U. S. Geological Survey, arrived at **Fairbanks, Alas., July 14.**

W. J. West, general superintendent for the Oliver Iron Mining Co., in the Virginia district, is recovering from an operation at Pocono Manor, Pa.

Donald M. Liddell, chemical engineer and metallurgist, 66 Broadway, New York City, who was in Joplin, Mo., recently, has returned to New York.

Henry M. Parks, director of the Oregon Bureau of Mines, who has been in New York recently on professional business, has returned to Corvallis, Oregon.

Bulkeley Wells, general manager, was at Pandora, Col., when the Smuggler-Union flotation mill was burned. He lost his own house and its contents in that fire.

F. W. Farnsworth, of Cincinnati, Ohio, president of the Chippewa Iron Mining Co., has completed an inspection of the company's Vermilion Range property.

Donald D. Smythe, of Bisbee, Ariz., geologist on the staff of the Phelps Dodge Corporation, recently examined mining properties near Ajo and Gunsight, Ariz.

William A. Clark, president, and **Chas. W. Clark,** general manager, were recent visitors to the United Verde Copper Co.'s mines at Jerome, and the smelter at Clarkdale, Ariz.

Karl Baumgarten, mining engineer of San Diego, Cal., examiner of U. S. War Minerals Relief Commission, has returned to Washington, D. C., from a month's trip to Oregon and California.

Hoyt S. Gale, who has been in South American for several months engaged in potash and nitrate investigations, is en route to the United States. Mr. Gale is expected to arrive in New York, July 28.

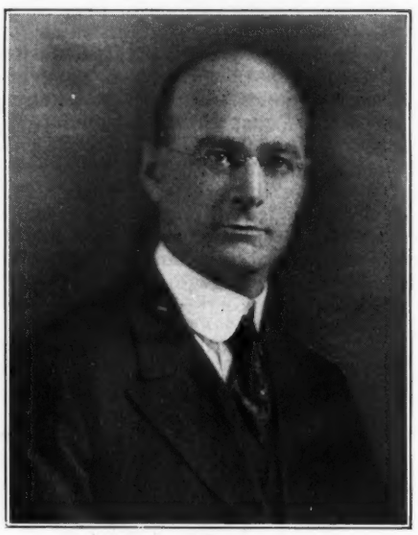
Charles D. Kaeding, vice president and general manager of the Candelaria Mines Co., of Reno, Nev., and consulting engineer of the Rochester Nevada Silver Mines Co., of Rochester, Nev., was in Reno, Nev., on July 5.

Harvey B. Small, mining engineer, who has returned from Colombia, South America, has left New York to examine mining properties in Tennessee, and will go thence to California to look after personal mining interests.

George L. Kaeding, in charge of operations at the Cortez Consolidated mine, was brought to Reno July 3 suffering from an attack of ptomaine poisoning. He quickly responded to treatment and will soon be out.

Sam C. Soupcoff, engineer with the American Smelting & Refining Co., was in Reno, Nev., July 4 on his return from a professional trip to the Yerington district. He has returned to his headquarters at Salt Lake City, Utah.

D. B. Scott, general manager of the American Silver Corporation, Mogollon, N. M., has resigned and left for California. Mr. Scott was also general manager for the Socorro Mining & Milling Co. before it was acquired by American Silver Corp.



G. F. LAUGHLIN

G. F. Laughlin, who was assigned as chief of the Mineral Resources division of the U. S. Geological Survey some months ago, though just now free to assume those duties, has been with that bureau since 1906, and has had a wide experience with both metals and nonmetals. He is better known as a specialist in building materials. He was formerly engaged entirely on the metallic resources of the country, and has been in charge of both the sections of the division he now heads.

Dr. Laughlin was born in Hyde Park, Mass., in 1880 and after graduation from Boston Latin in 1898 he studied sciences at Massachusetts Institute of Technology, receiving his Sc.B. from her in 1903. Later he earned a Ph.D. from Yale University. From 1906 to 1912, while instructor in economic geology at Yale, he devoted his summers to work for the Federal and the Connecticut geological surveys. During this time he studied the clays and clay industries of the state and assisted in preparing an educational series of the rocks of the state. He has done metalliferous work in the zinc-bearing sections of Leadville, Col., and Eureka, Nev., in Oregon and other western states.

During the war Dr. Laughlin prepared, from information at hand in Washington, a very satisfactory map classifying the road metals of France, which was early in the hands of the American Expeditionary Force.

W. P. Snyder and **C. D. Dyer,** president and vice-president respectively of the Shenango Furnace Co., have completed a visit to the company's Minnesota mines, making the trip on the steamer "W. P. Snyder Jr.," flagship of the Shenango fleet.

Lieut. Col. William Kelly, U. S. Engineer Corps, has been appointed by the President to serve with the Federal Power Commission as Engineer Officer. Much of Col. Kelly's experience in the Engineer Corps has been in California, where he has been brought in contact with water power problems.

E. R. Shorey, professor of mining and metallurgy, University of Wisconsin, is studying the mines and mills of the Black Hills, S. D. Prof. Shorey is accompanied by a number of mining students of the university, and before they return the class will visit mines in Montana, Idaho, and Arizona.

R. T. Walker, manager of U. S. Smelting & Refining Co.'s ore-purchasing department at Salt Lake City, has been promoted to their exploration department, and **M. Wallace Wooley** becomes office manager of the ore-purchasing department. **J. C. Brumblay,** the company's representative in Nevada and California for some years, will do ore-buying in the field.

W. Pellew-Harvey, of Pellew-Harvey & Co., London, England, is in Victoria, B. C., and will spend some months in a general survey of the mining development and possibilities of the province. Mr. Pellew-Harvey practiced engineering in the Canadian West twenty years ago and later moved to London. He is said to be in America on behalf of a syndicate of British capitalists.

P. G. Beckett, general manager for the Phelps Dodge Corporation, has announced discontinuance of the position of manager of the industrial relations division of that company, following the resignation of **T. H. O'Brien.** Mr. O'Brien, who has become general manager for the Inspiration Consolidated Copper Co.'s properties at Miami, Ariz., had been connected with the Phelps Dodge interests for twenty years, including ten years as manager of the corporation's coal mines at Dawson, N. M.

OBITUARY

Adolphe Carnot, chemist and mineralogist, died in France recently at the age of eighty-two. Carnot was honorary director of Ecole Nationale Supérieure des Mines, a retired Inspector General of Mines, and a Member of the Institut de France. He was a prominent French analytical chemist and author of "Traité d'Analyse des Substances Minérales."

THE MINING NEWS

LEADING EVENTS

Arizona Copper Companies Seek Lower Assessments

Reduction of Over $25,000,000 Asked in 1920 Valuation—Total for Forty-three Producers $389,000,000

The present condition of the copper market, together with the fact that many small mines have ceased to operate altogether and the additional fact that all properties are operating at from 35 to 60 per cent of normal capacity is given as the reason for a reduction of more than $25,000,000 asked in the valuation of mines in Arizona for 1920. The Arizona State Tax Commission has just announced its assessment on the operating mines for 1920 as $389,029,918.57 as against $414,236,636.90 for 1919. This valuation represents the forty-three producing mines in the state but does not include the smelters, or non-producing properties.

In dealing with the surplus stocks of copper on hand the commission has assessed such stock at 18.60c. per lb., which is subject to change depending upon what is actually obtained for this metal when sold.

The highest valuation was placed on the Copper Queen branch of the Phelps-Dodge Corporation, the valuation being $65,394,204.49, an increase of $1,767,402.02 over that in 1919. In the case of Inspiration Consolidated the valuation shows a decrease of $8,071,494, the assessed value this year being $65,372,690. The Calumet & Arizona also shows an increase in valuation, being rated at $42,163,006.94 this year as against $40,432,317.29 in 1919. The United Verde Copper Co. is rated at $40,095,385.25 for 1920 as against $43,822,275.40 in 1919. The United Verde Extension is assessed for 1920 at $34,561,479. Last year the valuation was $36,972,224.26. The Ray Consolidated is assessed at $39,834,159.15, an increase of $315,490.38 over the valuation of 1919.

Northwest Magnesite Dividends Involved in Suit

By Telegraph

To compel payment of dividends of $500,000 suit was brought at Spokane, Wash., on July 19, by R. S. Talbot, of Spokane, against William H. Crocker, of Crocker National Bank, San Francisco. Talbot was one of the first men to appreciate the commercial importance of Washington magnesite. He alleges in the complaint that Crocker is seeking by unfair means to secure control of the Northwest Magnesite Co., of Chewelah, Wash., which company Talbot promoted by securing financial aid from Crocker, R. N. Bishop, S. F. B. Morse, Wellington Gregg, Bart Thane, and the Sperry Flour Co., all of San Francisco.

WEEKLY RÉSUMÉ

Contempt proceedings against Miami Copper in the Minerals Separation case have been dismissed by the U. S. Court at Wilmington. Minerals Separation has been permitted to make the North American Corporation a party to the suit. The investigation of the Federal Trade Commission into the company's affairs has been resumed, this time in Salt Lake City. The president and two trustees of the Colorado School of Mines have been accused of unethical conduct in a report by a committee of the American Association of University Professors. In Arizona, the Swansea Lease, Inc., has suspended operations. In Utah, stockholders of the Montana-Bingham Consolidated are suing the directors for conspiracy and violation of agreement. In Washington, D. C., the U. S. Geological Survey has decided to expand its work of collecting copper statistics. In Nevada, the Tonopah Divide is reported to be developing a promising strike of good ore. The coal situation is said to be bad in Northern Ontario, and low water there is also causing power shortage.

Montana-Bingham Directors Sued by Stockholders

Conspiracy and Violation of Agreements Charged—Company's Funds Said To Have Been Wasted

Directors of the Montana-Bingham Consolidated Mining Co., of Bingham Canyon, Utah, which has been operating for the last five years the old Fortuna holdings, long owned by the Bambergers, are being sued by a number of stockholders, who are charging conspiracy and violation of agreements. A request for an accounting has been made. Plaintiffs in the suit are: Murray Carleton, J. Benton Leggat, B. E. Calkins, F. L. Melcher, C. R. Mower, and R. W. Grant. The defendants are: The Henry Waterhouse Trust Co., R. W. Shingle, A. N. Campbell, J. A. McCandles, John Watt, J. Jorgenson, C. G. Ballantyne, C. G. Bockus, L. R. Eccles, J. M. Eccles, E. A. Vail, J. B. Mossman, Imer Pett, and L. B. McCornick.

The complaint charges that the group in control has secured its control so as to use the funds for its own benefit in the way of excessive salaries and bonuses; that an inexperienced man had been hired as president and general manager at an exorbitant salary; that $105,000 was paid in five years to C. G. Ballantyne as president and general manager. It is also charged that the directors in return for positions on the directorate had promised that the company would be financed by the sale of 500,000 shares of stock at 50c. a share, and that not more than 265,000 shares had been sold. The property has been worked for five years by the present company, which includes Salt Lake and Honolulu interests.

Miami Copper Not in Contempt in Flotation Case

Minerals Separation May File Bill To Make North American Corporation Party to Suit

The petition of Minerals Separation asking that the Miami Copper Co. be judged in contempt of court and enjoined from further use of the former company's flotation process was ordered dismissed on July 13 by Judge Morris, in the U. S. District Court, at Wilmington, Del. In doing this, the court has sustained the contentions which were made upon the part of the Miami company at the hearing before the court on June 15. (*Engineering and Mining Journal*, June 26, 1920, p. 1426). Judge Morris' order is as follows:

"This cause was last before this court upon an application by the plaintiff for leave to file a supplemental bill. 264 Fed. 528. The plaintiff now charges by petition that the processes employed by the defendant since it stopped using the three processes heretofore adjudged to be infringements are also infringements and prays that the defendant be adjudged guilty of contempt and/or that further injunction be issued specifically enjoining and restraining the defendant from using such processes.

"The defendant by its answer denies that the new methods infringe the patents sued upon and moves that the rule to show cause be vacated and the petition dismissed upon the ground that, due to the character of the new processes, the present procedure is inappropriate for the determination of the questions raised. The plaintiff contends that it appears from the facts alleged that the new methods are the same in principle as those adjudged to infringe and that the defendant has made only a substitution of equivalents resulting in a mere colorable change in the process, while the defendant contends that those facts disclose that it no longer uses the agitation of the patent. Much testimony touching the processes in question has been introduced by the plaintiff before the master upon the accounting now being had. In fact, it is conceded that little testimony of any other nature has so far been presented.

"The present issues do not seem to make necessary a review of the cases upon contempt or those in which the procedure by supplementary injunction has been recognized. Although embarrassed by the fact that I do not possess the full knowledge of the intricate facts of this case that might have been gained had the testimony and argument in the main cause been heard

by the court as now constituted, I am, nevertheless, satisfied that the facts set up by the petition are not of the character required to sustain a judgment of contempt. Nor do I find that the practice of enlarging an injunction or granting a supplementary injunction has been adopted in this circuit. But, be that as it may, in view of the nature of the new processes used by the defendant as charged by the petition, the questions raised thereby, and the decision of the Circuit Court of Appeals in this case, 244 Fed. 752, I am of the opinion that the plaintiff must obtain the relief to which it is entitled, if any, touching the new processes, either through the proceedings now being had before the master and the decree to be entered thereon, or by a new bill and not otherwise. Which of these procedures is the proper one under all the circumstances or whether both must be resorted to, one as to some of the processes and the other as to the remaining processes, need not now be determined.

"An order vacating the rule and dismissing the petition may be submitted."

As to the petition for permission to file a supplemental bill making Minerals Separation North American Corporation party plaintiff to the suit, submitted with the motion setting up the filing of a disclaimer, Judge Morris expresses the opinion that it would be in furtherance of justice to grant leave to file, but without prejudice to the Miami company to renew its objections.

This matter was so very hurriedly argued at the time of the hearing upon the contempt proceedings that the granting of right to further argument appears reasonable. The important bearing of this feature of the case, it is said, seems to be that it has the possibility of so affecting the disclaimer as to the three claims of the patent No. 835,120, which were found invalid by the Supreme Court, that the present infringement suits might all lose their standing before the courts.

Ontario Government To Instruct Prospectors This Winter

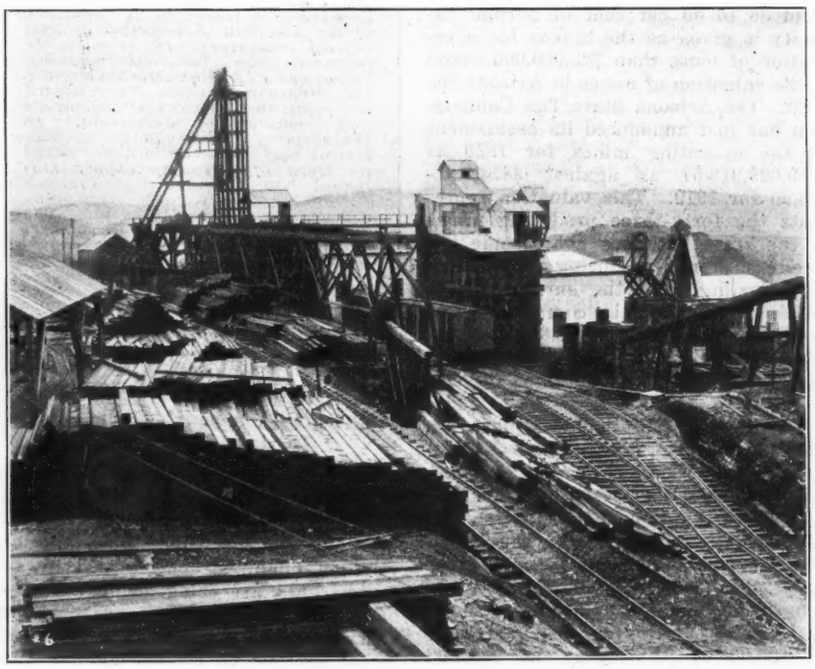
Harry Mills, Ontario's Minister of Mines, announces that short winter courses of instruction for prospectors will be opened at several mining centers in Northern Ontario, including Haileybury, Sudbury, Timmins, Swastika and some point at the head of the Great Lakes. It is proposed that the courses last six weeks, including such teaching by competent geologists as will enable the student to judge the economic possibilities of a district by its rock formations, and a general training in sampling and testing the value of ore. The courses, which will begin next winter, will be free to prospectors. Mr. Mills has also decided to open a government assay office at Kirkland Lake, which will make assays at cost.

Swansea Lease, Inc., in Arizona Suspends Operations

Would Also Shut Down Railroad Permanently—Old Planet Copper Mine Affected

The Swansea Lease has suspended operations and the Swansea railroad has applied to the Arizona Corporation Commission for authority to suspend operation. There apears to have been no trouble in finding an ample supply of ore of good grade or in handling it well in the new mill, which, it is claimed, made a better recovery than any other copper concentrator in the Southwest. It is said to have been demonstrated that a new mining method will have to be employed before profit can attend operation at the present price of copper. It was discovered that the shaft had been sunk at the wrong point. It was necessary to handle the ore from three to five times before it was dumped into the mill bin. The ore is a sticky material, needing much shoveling. A new shaft, possibly 1,000 ft. deep, is required, it is stated. This expensive work the leasing company is not prepared to take up.

The shutdown of the railroad has affected also the old Planet copper mine, on which operations had been started with expectation of heavy shipments. The Planet was the first copper mine of northern Arizona and was worked in the early sixties. Its ore was then rich enough for shipment by river steamboat to the Gulf of California and thence by sailing vessels to San Francisco and Wales. It has been badly "gophered" for its rich surface ores, but deeper explorations have found continuation into the sulphide zone of a body of good commercial ore.



HEADFRAME AT NO. 7 SHAFT, SWANSEA LEASE, INC., SWANSEA, ARIZ. THIS COMPANY HAS JUST SHUT DOWN

Many British Columbia Claims Revert to Crown

List of Properties Forfeited for Non-Payment of Taxes Surprisingly Large This Year

Lists of Crown-granted mineral claims which have reverted to the Crown because of non-payment of taxes and are now subject to lease under the terms of the taxation act have been forwarded to the gold commissioners and mining recorders throughout British Columbia. This publication is of surprising size, containing thirty-odd pages. Every mineral district of British Columbia figures in the tables it contains. As would be expected, the sections best known to miners have contributed to the Crown the greater number of delinquent mineral claims. The Rossland assessment district, for instance, has provided over 800 such properties, all of which, as stated, may be leased after compliance with the statutory formalities, the particulars of which will be furnished on application to the assessor. The Slocan assessment district, also, is well represented, with about 300 such claims advertised for lease. Nelson has about 328; Fort Steele, about 90; Kettle River, 170 odd; and, coming to Vancouver Island, it is found that Nanaimo has some 28 of these, presumably abandoned, claims; Cowichan, 18; Comox, 33; and Alberni, 45.

The Vancouver Chamber of Mines is engaged in assembling an exhibit of British Columbia ores that will be representative of the mineral wealth of the various mineral districts of the province.

Lake Superior Iron-Ore Shipments Increase in June

Shipments of iron ore from the head of Lake Superior during June showed an increase of 1,727,694 tons over May and are now within approximately one-half million tons of equalling the shipments as of July 1, 1919. Coal shipments for the week ending June 19, the first week under the revived pooling arrangement, showed an increase of 43,000 tons over the preceding week but are still only half as great as during a similar period last year. Lake dumpings to July 3 total 2,923,000 net tons, as compared with 8,136,000 tons on July 3, 1919. Below are details of iron ore shipments:

Dock	June, 1919	June, 1920
D. M. & N., Duluth	2,947,651	2,528,446
D. & I. R., Two Harbors	1,136,833	1,448,547
C. & N. W., Ashland	787,351	1,081,659
Soo, Ashland	163,936	218,161
N. P., Superior	66,404	106,604
Soo, Superior	201,047	217,683
G. N., Superior	1,621,397	1,931,963
	6,984,619	7,533,063

Dominion Steel Votes To Enter British Empire Merger

At a special general meeting of the shareholders of the Dominion Steel Corporation held at Halifax, N. S., the proposal to merge the company in the British Empire Steel Corporation was ratified without a dissentient vote. The Nova Scotia Steel & Coal Co. has already accepted the merger. The Canada Steamship Lines has yet to vote on the question.

Roy M. Wolvin, president of the Dominion Steel, made the announcement that the British Empire Steel Corporation had made a gift of $250,000 to Dalhousie University to be used for the purpose of providing more professorships in research work in connection with the natural resources of Nova Scotia.

El Paso Mica Co. Operating Mine in Petaca District, N. M.

The El Paso Mica Co., of El Paso, Tex., is operating a mica mine in Rio Arriba County, Petaca district, New Mexico, and shipping its crude product to a sorting and finishing plant on the outskirts of El Paso. Five carloads have been shipped to the plant already but three carloads of crude mica ready to be shipped have been greatly delayed due to high water in the vicinity of the mine. The result has been to temporarily shut down the finishing plant.

The deposit, which is a pegmatite vein reaching 30 ft. in width, affords a muscovite mica of excellent grade. Three drifts with connections, totaling 965 ft., have been extended into the deposit. The mine is at an elevation of 9,300 ft. At the finishing plant, sheet mica up to a maximum size of 8 x 10 in. is selected, packed in barrels and shipped. The residual mica is shipped in bulk as scrap mica. It sells for approximately $27 per ton. The clear sheet mica is practically all profit as the scrap mica brings in a return sufficient to repay mining and shipping expenses. About 35 girls are employed on finishing work. About three weeks are required to sort a carload of 55,000 lb. The coarse scrap mica is used for the manufacture of roofing material, the fine mica for rubber and the highest grade for making wall paper. At present the Richmond Mica Co. and the U. S. Mica Manufacturing Co. are receiving the output from the producer. There are other occurrences of mica in the distict which appears to give considerable promise of increased production.

Farmers Complain of Trail Smelter Smoke

Fifty-two claims have been made by farmers against the Consolidated Mining & Smelting Co. of Canada for damages to crops caused by the fumes from the Trail smelter. The allegations of those who seek compensation from the company are being investigated by Judge J. A. Forin and a party of advisers, some with legal and others with agricultural experience as their qualifications. Before setting out on a tour of the farms said to have been affected Judge Forin and party made an inspection of conditions in an adjacent valley outside the smoke area.

Civil Service Examinations

Those interested in the following examinations should apply at once to the Civil Service Commission, Washington, D. C., for the form indicated, stating the title of the examination desired.

Metallurgist, $10.80 per diem, both sexes. An open competitive examination August 3. A vacancy at Navy Yard, Norfolk, Va., and similar positions, may be filled from results. Not required to report at any place for examination; request Form No. 1312.

Associate physicist qualified in physical metallurgy, $2,000-$2,800; assistant physicist qualified in physical metallurgy, $1,400-$1,800; both sexes in both cases. An open competitive examination on application, until further notice. Vacancies in U. S. Bureau of Standards for duty at Washington or elsewhere, may be filled from results. Not required to report at any place for examination; request Form No. 1312.

Junior mining engineer, $1,500, both sexes. An open competitive examination on August 3. A vacancy in the Bureau of Mines for duty at Seattle, Wash., may be filled from results. Not required to report at any place for examination; request Form No. 2118.

Metallurgical laboratorian, $4.80 per diem, both sexes. An open competitive examination on application, until further notice. Vacancies at the Engineering Experiment Station, U. S. Naval Academy, Annapolis, Md., and elsewhere, may be filled from the results. Not required to report at any place for examination; request Form No. 1312.

Metallurgical chemist, $6.88 a day; assistant metallurgical chemist, $5.12 a day, both sexes. Open competitive examination, Aug. 10, 1920. Vacancies at the U. S. Naval Ordnance Plant, South Charleston, W. Va., and in positions requiring similar qualifications may be filled from the results.

Recent Production Reports

North Butte produced 1,616,822 lb. copper in June compared with 892,118 in May.

Butte & Superior in June produced 8,250,000 lb. zinc in concentrates and 160,000 oz. silver, compared with its output in May of 5,900,000 lb. zinc in concentrates and 103,000 oz. silver.

Granby Cons. M. S. & P. Co.'s output in June was 2,079,000 lb. copper, compared with 2,131,219 lb. in May.

Anaconda produced 12,700,000 lb. copper in June against 9,700,000 in May.

Shattuck Arizona produced in June 198,327 lb. copper, 661,746 lb. lead, 33,702 oz. silver, and 397 oz. gold in June.

Phelps Dodge produced 7,552,000 lb. copper in June against 7,902,000 in May.

Old Dominion's June output was 2,999,000 lb. copper compared with 2,287,400 in May.

Arizona Copper produced 3,000,000 lb. copper in June as in May.

Miami's output in June was 4,400,000 lb. copper; in May 5,054,760.

Utah Copper's June output was 10,000,000 lb. copper compared with 9,904,781 in May.

Chino produced 4,010,069 lb. copper in June compared with 3,930,728 in May.

Ray Con.'s June production was 4,520,000 lb. copper against 4,260,000 in May.

Nevada Con. produced 4,650,000 lb. copper in June against 4,350,000 in May.

Inspiration's output in June was 7,300,000 lb. copper; in May 7,500,000.

Greene Cananea produced 3,750,000 lb. copper in June compared with 4,300,000 in May.

Cerro de Pasco produced 3,944,000 lb. copper in June.

U. V. Extension produced 2,828,020 lb. copper against 3,219,934 in May.

Oriental Consolidated's clean up for June was $80,000 compared with $95,500 in May.

Calumet & Arizona's June production (available for company) was 3,812,000 lb. copper.

New Cornelia produced 3,664,000 lb. copper in June.

Kennecott Copper produced 10,120,000 lb. copper (including Braden's output) in June compared with 9,311,000 in May.

Calumet & Hecla produced 9,022,879 lb. copper in June compared with 8,803,811 in May. Output by subsidiaries in June was as follows: Ahmeek, 1,773,200; Allouez, 333,800; C. & H., 5,097,594; Centennial, 86,000; Isle Royale, 878,508; LaSalle, 0; Osceola, 661,500; Superior, 32,200; and White Pine, 160,077.

Shipments of domestic copper ore, matte, etc., from Alaska to the United States in June were 9,146 gross tons, containing 7,213,820 lb. copper.

(By cable)

Katanga's June production was 4,323,221 lb. copper compared with 3,847,027 in May.

Burma Corporation produced 4,733,120 lb. refined lead in June and 265,620 oz. silver.

Colorado School of Mine Officials Charged with Improper Conduct in Office

Committee of American Association of University Professors Reports After Prolonged Investigation

The president of the Colorado School of Mines, Victor C. Alderson, and two trustees, H. M. Rubey and James T. Smith, are scathingly arraigned in a report that has just been made by a committee appointed by the American Association of University Professors, in which it is charged that Dr. Alderson "repeatedly violated the essential principles of sound educational administration and of professional ethics." In preparing this report, the committee began its work in November, 1918, since which time they have been collecting evidence sustaining charges made against the school administration. The school board was again approached by the committee in 1919, but maintained that it was not responsible for the mistakes of the administration in previous years, although Dr. Alderson was still president, as he had been previously. "The principal charges on which the committee based its investigation," states the report, "were made by former professors of the school and were:

"1. That trustees intervened in matters of student discipline.

"2. That President Parmelee's dismissal was chiefly due to the stand he took in resisting the attempt of trustees to intervene in the question of discipline which arose at the time of the students' strike.

"3. That a number of teachers of professional rank were dismissed, mainly during the administration of President Alderson, without charges, hearing or adequate warning.

"4. That President Alderson discouraged high standards of scholarship and brought pressure to bear upon instructors to cause them to raise the marks of students.

"5. That President Alderson used his power of reappointment to secure support in the faculty of his personal policies."

The committee's report was signed by M. J. Libby, chairman; Herbert S. Hadley, ex-governor of Missouri; J. M. Coulter, H. O. Hoffman and A. A. Potter.

In the course of the investigation, witnesses were heard who recounted incidents sufficient to show interference by both Messrs. Rubey and Smith, with the authority of the faculty in administering the discipline of the school. The committee found that this intervention was made in such a way as to weaken the authority of the faculty and to encourage disorder and grave breaches of discipline in the institution. In summarizing the result of the investigation, the report asserts "the trustees of the Colorado School of Mines do not seem to realize the impropriety and the evil influence of their interference in the routine affairs and educational problems of the institution," and it warns "that the conditions brought out by the investigation unless remedied without delay will prove most disastrous to the future of the school." The state authorities are urged to appoint trustees who are competent to select and support a president who has proper educational ideals.

Rio Tinto Mines in Spain Cease All Work

The mines in the Rio Tinto region have ceased work completely and hundreds of the striking workmen have decided to migrate to other parts of the country or to go abroad, according to a press dispatch dated July 13. Many families are suffering from hunger. The entire district affected is in distress, owing to lack of articles of prime necessity.

The striking miners have maintained a quiet attitude, and up to the present the Government forces have not been required to intervene in the dispute. The directors of the English company controlling the mines still decline to concede any of the demands made by the workmen. On the other hand, the miners are remaining firm in their attitude.

Minerals Separation Hearing Renewed in Salt Lake City

After conducting its hearing in San Francisco in the course of its investigation into the methods of Minerals Separation, the Federal Trade Commission resumed its inquiry at Salt Lake City on July 13. Thomas Varley, of the local station of the U. S. Bureau of Mines, in testifying, stated that in his belief the effect of the license rates of Minerals Separation was to restrict the production of minerals by oil flotation. V. P. Strange, president and general manager of the Utah Leasing Co., testified as to his experience in the matter of royalty to be paid and the delivery of machinery, when his company undertook the treatment of the 800,000-ton tailings dump of the old Cactus mine near Newhouse, Utah. Delivery of machinery was refused when objection was made to an increase in the royalty beyond the amount agreed upon in negotiation with an official of the company. By means of a replevin bond the company secured its machinery, and for a time operated before a license was secured.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Geological Survey To Expand Its Work on Copper

Capt. Jenison, Succeeding B. S. Butler, Plans Exact Study of World's Production

Capt. H. A. C. Jenison is now in immediate charge of the U. S. Geological Survey's work on copper. He succeeds B. S. Butler, who recently entered private employment. Capt. Jenison is a mining engineer who has had ten years of very active and intimate association with copper mining in the United States, Mexico, Chile and Alaska. It is the intention of the Geological Survey, so far as conditions will permit, to expand its work on copper. In this connection Capt. Jenison has submitted a program which has been approved by Dr. George Otis Smith, the Director of the Survey. This work, of course, will be in addition to that of gathering the material which goes to make up the regular chapters on domestic and foreign production and the preliminary estimates which are made in July and January of each year. In order to make possible a more exact study and analysis of the world copper production and trade figures will be collected on reserves of all important lines in all countries. It is intended to calculate the ratio of reserves to present production and to production over a long period. A calculation will be made of the ratio of consumption to production and reserves over the same period. In connection with the foregoing work, "least squares" and "probability" curves will be developed to show past, present and probable future tendencies of production, consumption and reserves.

With regard to the domestic industry, it is the intention to collect monthly figures of production, stocks and sales from the principal producers from which data approximate figures indicating the condition of the industry can be prepared for publication at least once a quarter. This will allow the determination of when and where peak and minimum load occur and will make it possible to determine reasons of changes of the rate of mining and of transportation. This is expected to make it possible to indicate in advance where, under normal circumstances, prices may change due to probable excess and deficient production. It is intended to maintain

tabulated, confidential sheets for each important mine, smelter and refinery. This is in addition to the sheets for each state. The confidential sheets for each company will show the following: Production and character of ore; percentage recovery of metal from ore; tonnage treated at smelters and refineries; production and cost of refined copper, gold and silver from the mine and the names of the purchasers of the refined metals. Accurate account will be kept of exports and imports of copper ore, matte and metal, showing kinds and quantities, as well as sources and destination. This same plan will be carried out as far as is possible with regard to exports and imports of copper from foreign countries.

A card index and bibliography will be developed to cover exhaustively information pertaining to the geology, technology, reserves and development of copper mines.

Bill for Revising Mining Law Not Yet Approved by Ingalls Committee

The draft of bill providing for certain revisions of the mining code, which is in the hands of the chairmen of the Committees on Mines and Mining of the Senate and of the House, has not been approved by the committee headed by W. R. Ingalls, according to Dr. F. G. Cottrell, Director of the Bureau of Mines. The bureau is co-operating in the effort to present to Congress the draft of a revision-of-laws bill, along with copious notes showing wherein certain changes may be controverted. Dr. Cottrell explains that the draft, which has been prepared, is for submission to the members of Mr. Ingalls' committee and has not been approved by them. They are to go over the draft between now and the opening of the new session of Congress and Dr. Cottrell points out that it is altogether probable that many changes will be made in the document as it now stands.

The draft of the bill was sent to the chairmen of the Committees on Mines and Mining at the same time that it was sent to the members of Mr. Ingalls' committee, so that they might be kept informed as to the work being done. Every effort will be made to present a revised draft to these Congressional committees with the hope that they will find it possible to take up the consideration of the matter soon after the convening of Congress.

War Mineral Awards Average One-third of Claims

Awards have been recommended as follows by the War Minerals Relief Commission during the week ended July 10 (the name of the claimant, the mineral, the amount recommended and its percentage relationship to the amount claimed are shown): H. T. Stiles, manganese, $2,954.90, 79 per cent; Thomas H. Green, manganese, $792.75, 77 per cent; Wells & Pollock, chrome, $993.21, 64 per cent; A. G. Green, chrome, $2,152.38, 47 per cent; Alexander R. Shepherd, tungsten, $1,025.75, 35 per cent; Scherer & Wall, manganese, $768.42, 14 per cent; Neely Bros., Inc., chrome, $23,040.98, 17 per cent; C. H. Palmer, manganese, $489.82, 100 per cent.

Up to July 10 the commission had acted on 904 claims in which $9,909,093.06 was asked by the claimants. The average percentage recommended for payment on all the claims is 33.07 per cent.

Outlook Unpromising in Nevada Districts, Ferguson Reports

Labor conditions and costs are such in the Manhattan and Round Mountain districts of Nevada as to give no particular promise for early resumption of gold mining operations on a large scale. Much of the ground of the larger companies is being turned over for leasing and not operated for company account. This report on conditions is brought back by H. G. Ferguson, of the U. S. Geological Survey, who has been doing geologic work in those camps. Mr. Ferguson also visited the property near Silver Peak, Nev., where a mill is being put up for handling potash alum by the Silver Peak Chemical Co.

NEWS BY MINING DISTRICTS

ARIZONA

Dripping Springs Copper Buys Broken Hills Equipment—Little Treasure Group at Winkelman Sold

Bisbee—The ventilating shaft that is being sunk by the Calumet & Arizona Mining Co., southeast of the Briggs shaft, has reached a depth of 310 ft. This means that an average of more than 8 ft. per day has been made since the work started. The shaft was deepened 54 ft. in six working days recently. The work is being done on contract. When completed the shaft will be about 800 ft. deep.

The company is installing two more boilers which will give the boiler plant an equipment of 15 instead of 13 boilers. The increased flow of water that is expected to be encountered when the Junction shaft is deepened is the reason for increasing the boiler capacity. Plans for sinking the Junction shaft from the 1,800 to the 2,200-ft. level are now underway.

Winkleman—The Dripping Springs Copper Co. has purchased the mining equipment of the Broken Hills Mining Co., at Ray, and moved it to its property near here. This will greatly facilitate development through the long crosscut tunnel. Pending the installation of this equipment a raise is being driven for ventilation. Improvements are being made in the roads to facilitate shipments of ore to the Hayden smelter.

The most important transaction in mining property this year in Pinal County, Ariz., took place on July 10 when the Arizona Silver Consolidated Mining Co. acquired the Little Treasure Group, from N. H. Mellor. The property consists of nine claims, situated in the Saddle Mountain mining district about five miles east of Winkleman. It has never been worked extensively but has produced some very high-grade silver ore.

The new company is headed by John Hartnett, Jr., of Washington, D. C., who has been auditor to the General Staff of the War Department. Dr. Hartnett is president. Captain Walter E. Purvis is secretary-treasurer, to be in charge of the eastern offices. C. T. Carpenter, of Phoenix, will be secretary in the Arizona office. E. T. Herrmann is general manager and G. G. Wald, of Phoenix, is consulting engineer. The company has begun construction of a camp and will improve the roads leading from the main highway at once. It plans to start development of the Little Treasure vein system on August 1 along the lines laid out in the original report on the property made by Arthur L. Flagg, consulting engineer.

ARKANSAS

Good Demand for Batesville Manganese Ore Reported

Batesville—There is renewed activity in the manganese industry in the Batesville district. The demand is good for ore at a price on which operators can make a profit. High-grade ore is most in demand but some as low as 30 per cent is moving.

The National Manganese Co., which owns property near Anderson, is preparing to construct a dam across Lafferty Creek, which will create a large reservoir of water to be used for ore washing. It is intended to erect a large washing plant and install hydraulic mining machinery at once. A tram will also be built from Anderson to Penters Bluff, the shipping point, four miles away.

Joe Magness and associates, who have a lease on the Manganese Cave property at Penters Bluff, have completed a switch and built chutes to it from the adit on the mountain side. Ore is thus

dumped directly into the car. From one to two cars a week is being produced.

Tom Shell has a large crew of miners at work on his property near Cushman and is making a good production.

Case and Wilson are opening up a fine body of high-grade ore on their property at Penters Bluff.

E. C. McComb, of the Independence Mining Co., has one steam shovel and the washing plant in operation at the Polk-Southard Mine near Cushman and will start operating a small washer at Penters Bluff soon.

CALIFORNIA

Idaho-Maryland Gets Golden Gate Stamp Mill—Rising Sun's New Mill Running—North Star Abandons Champion

Portola—The Engels and Walker companies are shipping large tonnages of copper concentrates from their flotation plants. New development has added extensively to the reserves of both properties. At the Engels group recent work has opened up rich deposits and the grade of ore is said to exceed any ever discovered previously in the district.

All other mines in the Plumas copper belt are doing extensive development work. Practically every company reports development of profitable ore, with new work materially extending the dimensions of the proven ore belt.

The Gruss company has just acquired two claims lying to the east of its former holdings. The new acquisition is considered important.

Nelson Creek—An unexpected cloudburst wrecked the equipment of the company employing a diving method at Nelson Point. Several sluices and other devices recently set in place were washed away.

Benton—Several shipments of rich silver ore have been made by companies and lessees in the Benton district in Inyo County. Many new interests are seeking to acquire holdings in the camp.

Grass Valley—The Idaho-Maryland has acquired the ten-stamp mill formerly in commission at the Golden Gate group.

The Mayflower Mining Co. at Canada Hill has purchased the mine plant and headframe of the Golden Gate, which will be moved to the Lily property.

The Empire Mines Co. has 80 stamps dropping on high-grade ore taken from the Empire and Pennsylvania. The mine force has been increased and the development of new territory below the 4,500-ft. level is proceeding satisfactorily.

Nevada City—The North Star company has announced that all work has been abandoned on the Champion group at Nevada City. The Champion was bought several years ago by the company but proved a losing venture despite every endeavor to develop commercial ore at greater depth.

Work at the Alcalde, Boundary and other local properties is progressing, and the several managements are quite pleased with the showings. The North Star's Central mill is running steadily.

Colfax—The Rising Sun company has completed installation of the ten stamp mill and the plant is now in commission. The ore being taken from the mine is of high grade. The shaft is now down to the 900-ft. level. No development of consequence has been done below the 400-level, but $2,000,000 has already been taken from the mine.

COLORADO

Smuggler Union Preparing To Rebuild Flotation Plant—Drilling Contest at Idaho Springs

Idaho Springs—The Fourth of July celebration included an old fashioned miner's drilling contest, in which the double-hand event was won by W. H. Keelor and Frank Cramer, who drilled a hole 20 1/16 in. in ten minutes, in hard Silver Plume granite. The single-hand contest was won by Tony Zancanelli who drilled a hole 15 in. in ten minutes in Silver Plume granite.

Telluride—The Smuggler-Union Mining Co. continues milling operations as well as possible without its flotation plant, which was recently destroyed by fire. Arrangements are being made to rebuild the plant. As much material as possible will be purchased in Colorado. About 100 workmen and several teams are engaged in clearing away the fire rubbish, preparatory to laying foundations for the new buildings. The new office building is under construction. The new mill buildings will be of steel and concrete.

Boulder—The Nil Desperandum Mining Co. has been reorganized, with a capital of $500,000, divided into 500,000 shares of a par value of $1. The company plans to list its stock on the New York Curb. Considerable new development work is under consideration.

The Boulder County Mines Co. has installed flotation equipment in its mill and is planning to resume development work in its lower tunnel.

The Caribou mine has resumed active operations. The 1040-ft. shaft has been repaired, and ten sets of lessees are mining ore between the surface and the 840-ft. level. Some of the ore is high grade, and a recent shipment averaged 397 oz. silver per ton. A block of ground on the 10th level will be developed on company account. J. G. Clark is manager.

The Telegraph mine is being equipped with a 25-ton mill. The plant is rapidly nearing completion and will probably be in operation this month. The equipment includes crushing rolls, a ball mill, electrolytic amalgamating tanks and flotations cells. The management plans to treat the fines and slimes separately in Ogden amalgamating tanks. The pulp from these tanks will be passed to the flotation cells.

Gypsum Valley — The Cummings Chemical Co. is increasing its operations in Gypsum Valley, San Miguel County, Col. Carnotite ore is being shipped via Placerville to the Rare Ore Sampler at Montrose, and thence to Eastern buyers. O. B. Willmarth is manager.

The Carbonero mine is being operated by Ruutilla & Brown, who are shipping high-grade silver-lead ore, some of the product going to Midvale, Utah, and some to the Pueblo smelter.

The San Bernardo mine is being developed and equipped by the Valley View Leasing & Mining Co. Most of the machinery for the new mill is on the ground and the plant is rapidly nearly completion. Underground development continues with promising results.

Cassells—Operations are being resumed for the summer at the mine and mill of the Whale Mines Leasing & Reduction Co. A. C. Dart is superintendent.

IDAHO

Cœur d'Alene Syndicate Drops Option on Black Bear—Big Creek Company Offering 50-cent Bonus

Mullan — Arrangements are being made to resume operations on the American-Commander about Aug. 15, by which time it is expected that a compressor will be in position and all other equipment necessary. A good showing of lead-silver ore was exposed many years ago and a crosscut has been run 3,000 ft., but without finding the ore. A few months ago the West Hunter company, joining the American-Commander on the south, started a crosscut south from the American-Commander tunnel and at a distance of about 150 ft. cut a strong vein and a shoot of good ore about 8 in. wide on the west side of the crosscut and 18 in. on the east side, indicating an important orebody lying to the east. It is now planned to drift east on this ore.

Kellogg—T. S. Welch, of Butte, has secured an option on all outstanding stock of the Blue Star Mining & Milling Co. and is preparing to begin work by Aug. 1. A shaft has been sunk 500 ft. A crosscut at 300 ft. and a drift have disclosed some promising lead-silver ore, particularly in a winze 40 ft. deep, in which a small stringer of ore has widened to about 2 ft. A crosscut has also been started from the bottom of the shaft and has about 150 ft. to go to reach the vein. The extension of this crosscut will be the first work undertaken by Mr. Welch and if results are satisfactory the shaft will be sunk 300 ft. further. The property is favorably located, being only about 1,000 ft. from the railroad.

Gem—After many years of idleness another effort is to be made to find a commercial orebody on the Bell. A lease and bond has been taken on the property by Axel Swan, who, after a careful examination, believes he can solve the problem by driving a crosscut about 100 ft. from No. 2 tunnel. The

property is owned by the Bell Mining Co., control of which is held by the estates of Finch and Campbell. The surface showing is one of the best in the district and indicates a large orebody, which Mr. Swan will now make another attempt to find.

Wallace — The option held by the Cœur d'Alene Syndicate on the control of the Black Bear Mines Co. has been surrendered. The first payment on the option was due June 30. A few weeks prior to that date a request was made for an extension, and this being refused the option was given up. The syndicate has an option on control of the Flynn Group Mining Co., adjoining the Black Bear, and has an easement which gives it the right to use the Black Bear tunnel as a means of entering the Flynn ground. This right is not affected by giving up the Black Bear option and the development of the Flynn is proceeding as usual.

The Big Creek Mining Co., which normally employs about 25 men under ground, in order to overcome the difficulty in holding employees, is offering a bonus of 50c. per day to all men who remain on the job 30 days, the bonus to continue as long as they remain. This makes a daily wage of $6.25. The larger companies experience much difficulty in holding men and some of them pay a bonus in special cases. At the Morning mine the contract system prevails, the men making from $7 to $11 per day.

MINNESOTA

Mesabi Range

Steel Corporation Gets Polk & Jackson Interest in Walker Iron Mine

Coleraine—The Polk and Jackson mining companies, subsidiary to the Great Northern Iron Ore Properties, have turned over their one-half interest in the Walker iron mine to the U. S. Steel Corporation receiving in exchange therefrom the one-half interest of the corporation in the Hill mine. Several other smaller properties are involved in the exchange, bringing the total estimated tonnage up to 90,000,000 tons.

One shovel is stripping and one shovel mining ore at the Mahnomen mine, Ironton.

The stockpile of 4,500 tons at the Algoma mine, a former property of the Onahman Iron Co., has been shipped.

Buildings and equipment at the Ferro mine near Trommald have been advertised for sale at sheriff's sale July 10, sale having been postponed from June 19. Sale is advertised by the Gorham-Garbett Co. of Minneapolis, fee owners of the property, who hold mortgage against the property for unpaid royalties in the sum of $14,000. Property is completely equipped and developed. It was operated during 1917 and 1918 by the Onahman Iron Co., an Omaha concern which also operated the Algoma mine and which lately went bankrupt. During 1918 it shipped monthly about 4,000 tons of manganiferous ore to the Algoma Steel Co. The property has been idle since the fall of 1918, at which time work was started to sink the shaft an additional 140 ft. from the 145-ft. level to develop the ore lenses at depth. The ore is a hard, silicious, low phosphorus and moisture, manganiferous iron ore, and will average over 20 per cent natural manganese, with 18 to 20 per cent silica. The reserve tonnage is not large.

The Mangan No. 1 stockpile near Ironton, amounting to 7,000 tons has been shipped by Clement K. Quinn & Co. The property has been idle since the winter of 1918-1919.

The Maroco mine of the Marquette Ore Co. at Trommald, an E. N. Breitung enterprise, is sinking an inclined shaft to the 200-ft. level, for drainage of the orebody preparatory to stripping and open pit mining. Shaft is now at 150 ft. and good progress is being made. The sand sucker and other hydraulic stripping equipment has been set up on the property for over a month, but orders have not been given to go ahead. Property contains several million tons of ore, about one-half of which is washable. Contract has been let for the erection of a one-half unit washing plant for which Allis-Chalmers Co. are furnishing the machinery, and the timbers for the structure are on the ground.

MISSOURI

New Zinc Oxide Plant Damaged by Fire —Butte-Kansas Mill Ready Soon

Waco—The Acme mine and mill have been turned over to lessees. The management has two drill rigs outlining new orebodies.

The new Butte-Kansas mill, replacing one that caved into the mine, should be ready about August 7.

Joplin—The baghouse at the newly completed plant of the Metals Extraction Corporation was burned on July 9. The walls are intact. Reconstruction is to begin at once and should be completed by August 15.

MONTANA

Davis Daly Mining High Grade on Butte & Ramsdell Ground

Butte—Ore production from North Butte's Granite Mountain and Speculator properties is being increased slightly and a larger output is looked for in July. The showing on the lower levels of the Edith May vein continues favorable.

The recent ore shoot disclosed on the 500-ft. level of Tuolumne Copper's Main Range mine continues steady at about 40 oz. of silver per ton with up to 2 per cent and more of copper. Resumption of sinking of the winze from the 1,200-ft. level, where there appeared to be a good ore, is planned by the company.

The development drift on the vein near the station on the 2,700-ft. level of the Colorado mine continues in ore. A body of ore more than 400 ft. long and about 8 ft. wide has been opened, all being of a commercial grade.

Sinking of the Plutus shaft is under way with the object of opening on the 400-ft. level an orebody found near the surface of the Norwich claim adjoining.

Further underground development has been temporarily suspended by the Butte Metals company.

Mining of the high-grade ore from a fissure striking through the Butte & Ramsdell property on the 2,500-ft. level of the Ramsdell claim has been begun by the Davis-Daly company under a profit-sharing arrangement with the Butte & Ramsdell. The latter has approximately 250 ft. on the strike of a vein showing about 6 ft. of 20 per cent copper ore.

Marysville—Operations at the Piegan-Gloster mine are expected to be suspended soon. Operation of this property last year cost the Barnes-King approximately $88,000. The Shannon mine is showing up well. The new orebody opened on the 500-ft. level having a width of 6 ft., the ore running $14 per ton. Barnes-King invested $17,000 in an oil well venture thus far without success. This well is located in the northern part of Montana, in the Winifred field and drilling has been interrupted by considerable casing trouble.

Elkhorn—Drifting by Boston & Montana on the 300-ft. level of the Blue Jay vein is still in ore and has been exposed. This drift is being driven away from the big fault. Housing of the new mill is under way, the foundation having been completed about three weeks ago.

NEVADA

Promising Ore Reported on 375 Level of Tonopah Divide—New Vein Cut in Combination Mine at Goldfield

Tonopah—The final June clean-up of the Tonopah Belmont was 87,846 oz., valued at $96,630. Development and stoping are being done on fifteen veins in this property. The principal tonnage is being mined from the Rhyolite veins, and the Belmont, Rescue and South veins. There is more ore in sight than a year ago and development possibilities are good.

In the Tonopah Extension the work of sinking the Victor shaft from the 1,760 to the 1,880-ft. point is progressing. There is considerable water to handle but surface equipment and pumping facilities are capable of handling it. Reports indicate that developments on the Murray vein on the 1,760 level continue good and great hopes are entertained for the next level. Sinking of the McCane shaft to the 1,540 level of the Victor workings will soon be started, and connection made with them.

The last shipment for June from the West End was 50,830 oz., with a value of $55,900. Development is satisfactory with no changes of importance.

The latest bullion shipment from the Tonopah Mining Co. mill at Millers was valued at $40,000. Development for the last week totaled 163 ft. with no changes. Conditions are reported good in the Silver Top and Mizpah shaft workings.

The Rescue Eula is making regular shipments of ore. Development work on the Rescue vein is producing good results and some tonnage is being blocked out.

Divide—Very favorable reports are being circulated regarding developments in the Tonopah Divide mine on the 375 level. A drift started on a small stringer of ore on this level now shows a full face of ore of good grade, with only one wall in sight. The drift is now in about 50 ft. and all material is reported to have averaged $40 per ton for the last week. This is welcome news to stockholders and if the showing continues good will undoubtedly renew interest in the whole Divide district.

Goldfield—A new vein, in the footwall of the Combination vein, is reported to have been discovered on the 480 level of the Combination mine. The drift is in milling ore. The Goldfield Development is operating 20 stamps and expects to increase production soon. When complete the mill will have a capacity of 2,000 tons per day.

The Goldfield Deep Mines Co. expects to start sinking its projected 3,000-ft. shaft on July 16. The hoisting plant of the Goldfield Merger will be used and is now being moved to the site of the new shaft. A special meeting of the Atlanta, C. O. D., Goldfield Merger, Blue Bull, Goldfield Combination, and Milltown companies will be held in Goldfield on July 16 to ratify the combination.

Hilltop—Roy J. King, formerly with the Tonopah Belmont Development Co. but now consulting engineer for the note holders of the Kimberley Consolidated, is doing development work on the latter company's property at Hilltop, in Lander County.

Taylor—The 100-ton cyanide mill of the Wyoming Mining & Milling Co. at the old camp of Taylor, White Pine County, is running steadily and is said to be making a high extraction. There is about 30,000 tons of ore on the dumps, which was expected to go 12 oz. in silver to the ton, but the average so far is said to be nearer 17 oz. The water for the mill is piped five miles from Connors Canyon springs.

Golconda—The compressor at the Adelaide mine near Golconda has been bought by the Cortez Consolidated and will soon be installed. This will facilitate work in extending the Arctic tunnel which is being driven to get under the orebody from which the big production was made in the early days.

Cherry Creek—John Carlson, Herman Brest and Joe Carpen are sacking ore running well in gold and silver from a strike they recently made at the mouth of Silver canyon, four miles from Cherry Creek. The shaft is down 16 ft.

Hamilton — Ed. Wilson recently shipped a carload of ore sampling $125 per ton from the Great Valley mine at Hamilton, the shipment going to the smelter by way of Ely.

Osceola—Clyde Tilford and brother, who are placer mining at the old camp of Osceola, recently found some good-sized nuggets.

Gold Circle—William J. Cleary and associates, who recently closed a deal for the Esmeralda mine, have secured options on the Bamberger and Coalition mines in the northern end of the district.

So much water came from the last holes drilled in the crosscut on the 315-ft. level of the Queen mine that it was decided to plug them and await the installation of a pump before shooting and opening up the vein.

Virginia City—The south drift from the main crosscut on the 150-ft. level of the Comstock Phoenix is being advanced in ore that is said to average $30 per ton.

NEW MEXICO

Porterfield Bros. at Silver City Shipping Large Tonnage of Manganese Ore

Lordsburg—At the 85 mine the C. & A. company is down 815 ft. Work is being pushed by 21 men working in three shifts.

The Octo main shaft has reached the 300-ft. level and a station, 10 x 20 ft., will be cut. A sump, 10 x 10 x 20 ft., will also be put in. A drift to the east will be run and the shaft carried to the 400-ft. level at once.

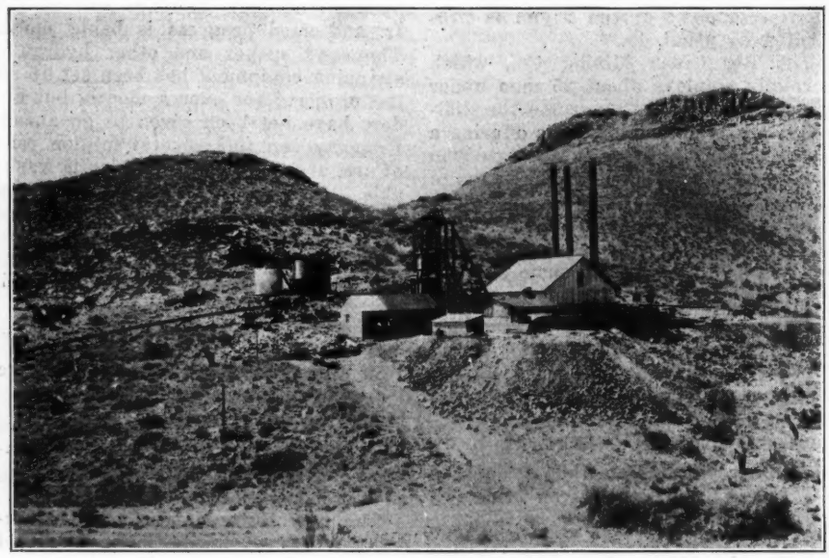
Silver City—During June Porterfield Bros. shipped from the Amory Stevens properties on Boston Hill a large tonnage of manganiferous iron ore, although they were without cars for eleven days because of the washout on the Santa Fe line near San Marcial. The Santa Fe will build a new ore-loading platform to accommodate this business.

Hachita—The Little Hatchet Mining Co. has established a camp 12 miles southwest of Hachita and will sink two shafts upon some promising copper deposits recently opened up. Head frames and hoists are being installed and a compressor will be purchased.

UTAH

North Standard Stockholders Seek To Change Control, Charging Irregularity in Administration

Park City—The Park-Utah has followed a vein of shipping ore for 450 ft. and has 150 tons ready for shipment as soon as arrangements have been completed for taking it out through the 1,500 level of the Ontario, through which the Park-Utah is working.



SURFACE PLANT OF OCTO COPPER MINE, LORDSBURG, N. M. SHAFT IS 300 FT. DEEP. LEE'S PEAK IN BACKGROUND

The Keystone, which is resuming work after the settlement of litigation with the Silver King Coalition, shipped a car of ore the week ended July 9. The Naildriver shipped two cars the same week. The Ontario is short about 50 men and more could be used at all of the mines.

Eureka—The Grand Central at Mammoth is receiving its water from wells near Diamond instead of Eureka. The water runs down from Diamond to Mammoth by gravity, and is then pumped to the mine. Regular shipments are being made of ore coming from between the 540 and 2,100-ft. levels.

At the North Standard the shaft is down 600 ft. An effort is being made to effect a change in the control of the property on the part of some of the stockholders, who accuse the present management of irregular methods of administration. The officers of the company have prepared a financial statement, and have called a meeting for

August 2. The opposition has called a meeting for July 17.

Marysvale—A four-mile paved road is proposed from Marysvale to Alunite to be built by means of county funds and contributions from the mining companies chiefly interested, in this case the Mineral Products and the Deer Trail. It is proposed that the county finance three miles of the road and the companies one mile.

WASHINGTON

Northwest Magnesite Co. Plans New Six-Mile Tramway to Keystone Deposit

Chewelah—The Northwest Magnesite Co. is planning the erection of a six-mile aerial tramway to connect the Keystone magnesite deposit with the present tram between the Finch deposit and the company's large calcining plant at Chewelah. Up to the present practically the entire production of the company has come from the Finch deposit, which has been worked intensively and the other holdings kept in reserve. The Keystone deposit is well developed and fully as large as the Finch deposit and it is evidently the plan of the company now to extend operations to the Keystone quarry.

The American Refractories Co. is employing a crew of 60 men at the Double Eagle magnesite deposit, which it now operates under lease and bond. It is burning the magnesite in shaft kilns located on the property and the finished material is shipped by auto trucks to the railroad at Valley, 13 miles distant.

CANADA

British Columbia

Trail—Ore shipments received at the Consolidated M. & S. Co.'s smelter during the week ended July 7 were as follows:

Mine Location	Gross Tons
Bluebell, Riondel	138
Crescent, Greenwood	2
Emerald, Salmo	47
Electric Point, Boundary, Wash.	135
Florence, Princess Creek	35
Josie, Rossland	172
Monarch, Field	31
Mandy, Le Pas, Man.	1006
North Star, Kimberley	216
Sally, Beaverdell	42
Company mines	7213
Total	9035

Victoria — The British Columbia department of mines has sent two reconnaissance parties into the Unuk River country, north of the better-known section of the Portland Canal district, this summer. They were organized by George Clothier, resident engineer at Prince Rupert, B. C., and will work along lines laid down by him. One of Mr. Clothier's parties on reaching the Unuk River will work in a southeasterly direction, eventually meeting the other explorers, who will go in by the Salmon River, over the divide to the Naas slope and northwesterly along the line of contact.

Word received recently by mail from Dawson, Y. T., appears to confirm the recent report of a new silver strike in the Mayo district. The latest discoveries are on the slope of Mount Hinton, opposite Keno Hill. They are about five miles from Keno Hill, where the first excitement occurred, the waters of Lightning Creek separating the two. When the news reached Mayo there was a stampede and the ground has been thoroughly staked. As to the Keno Hill properties it is stated that one company has found a rich new silver deposit near where they have been working.

A pioneer prospector writing to a prominent resident says: "I've been up Keno prospecting. I located three claims and hope to prospect for the remainder of the summer. I got in on the new stampede. It is located near the head of Lightning Creek and shows gold and galena. Everyone is away stampeding. Middlecoff Hydraulics are about closed and the men are staking. They are opening up the biggest thing yet on Keno Hill, taking the ore out of the mud, five feet wide and had it stripped over 200 ft. in length two days ago. It runs 1,000 to 2,000 oz. to the ton, and they take it down to the frost about one foot deep and there must be a big lead under. The worst drawback at present is too many stakers and too few prospectors."

Ontario

Coal Situation Worrying Operators—Lower Water Causes Power Shortage

Colbalt—The coal situation is causing serious concern to operators in Northern Ontario. The majority of the mines have contracts for coal at prices considerably below what coal is now selling at, but, so far this season, very little coal has arrived and there is a good deal of uncertainty as to whether or not this contract coal ever will arrive. Local dealers are quoting up to $18 per ton, f.o.b. the cars in Cobalt, and state they cannot get much, even at that price. As it will be necessary to start the boilers for heating purposes in about three months, the necessity for some assurance of coal supply is evident.

The exceptionally low water this season is having its effect on the power company in Cobalt, and has resulted in a drop in the pressure of the air supplied. Ordinarily air is supplied at 100 lb. pressure, but recently it has dropped as low as 50 lb. To complicate the situation further the power company has had several breakdowns lately. The Kirkland Lake camp is also suffering from a shortage of power, which is supplied by the same company that furnishes power to Cobalt. The Wright-Hargraves is forced to use steam power for underground work, and the Teck-Hughes is operating at about two-thirds capacity.

Premier Drury of Ontario, speaking recently, stated that the investigation of the Department of Lands and Forests had shown the timber industry to be rotten to the core. As soon as the inquiry is finished, the mines will be investigated to see if the public has been defrauded there.

The Bailey Silver Mines, of Cobalt, will build a railway spur to the property to permit the shipment of low-grade ore to the mill. A considerable quantity has been developed, and, in addition some high-grade is being mined.

The Colonial, idle for several years, has been re-opened. The property is equipped with a small mill, but it is doubtful if this will be operated.

The Right-of-Way mine is shipping 50 tons of mill rock a day to the Northern Customs concentrator.

South Lorraine—The Keeley mine has developed a shoot of high-grade milling ore at a depth of 300 ft. The 80-ton mill is rapidly nearing completion.

Gowganda—The Bonsall property in Gowganda, now owned by Sir Clifton Sifton and George Glendenning, is being operated.

The Trethewey property in Gowganda is making another shipment of high-grade ore. Conditions at the property are very satisfactory.

Porcupine — The McIntyre fiscal year ended June 30 and, although the annual report is not ready, it is understood that production will be about $2,250,000 and net profits about $1,000,000.

Diamond drilling on the Porcupine Crown has shown ore at 1,100 ft. This is either a new vein or the faulted portion of the old vein.

The New Imperial Mines Limited is to be opened up. A permanent liquidator will be appointed July 26.

Manitoba

The Pas—The Board of Trade of The Pas, Manitoba, are planning a special trip to mining districts of northern Manitoba on Sept. 1. The party will start from Winnipeg and will probably arrive at The Pas Sept. 2, leaving there on "S. S. Nipawin" on Sept. 3 for Sturgeon Landing. From there the party will proceed by canoe and Evinrude motors to the Flin Flon and Mandy properties.

An invitation is being issued to every member of the Manitoba provincial government and it has been intimated that most of the members of the House will avail themselves of this opportunity to become familiar with the need of this mining district and particularly as the government will be called upon to vote for a new railway from The Pas to Flin Flon at the first session of the new parliament. The proposed new railway will pass through the Elbow Lake section, also through the Cranberry Lake, Copper Lake, Athapapouskow Lake, Schist Lake and Flin Flon Lake districts.

Recent discoveries in the Elbow Lake section have caused considerable interest being taken in the district and prospectors and mining men have concentrated there.

THE MARKET REPORT

Published in part in San Francisco and mailed from there to our Western subscribers as a special service without charge pending the arrival of the *Engineering and Mining Journal*

Silver and Sterling Exchange

July	Sterling Exchange	Silver			July	Sterling Exchange	Silver		
		New York, Domestic Origin	New York, Foreign Origin	London			New York, Domestic Origin	New York, Foreign Origin	London
15	387½	99½	92¼	53⅝	19	384	99½	88¾	52
16	388	99½	90¼	52½	20	382	99½	89½	52¾
17	387	99½	89⅜	52	21	383	99½	94	55¼

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

On the authority of the Secretary of the Treasury, we quote 100c. per oz. for silver, 1,000 fine, delivered at the option of the Director of the Mint to the New York Assay Office or to the mints in Philadelphia, Denver, or San Francisco, and proved to the satisfaction of the Treasury Department to have been mined, smelted, and refined in the United States. This quotation is retroactive to May 13.

Daily Prices of Metals in New York

July	Copper	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
15	18.55@18.75	45.75	49.50@50	8.20@8.35	8.20@8.35	7.75@7 85
16	18.50@18.75	46.25	49.75@50.25	8.25@8.30	8.25@8.30	7.75@7.85
17	18.50@18.70	46.25	49.75@50.25	8.30	8.30	7.70@7.80
19	18.50@18.70	46.00	49@50	8.30	8.30	7.70@7.80
20	18.50@18.70	45.50	49.25@49.75	8.35@8.65	8.35@8.65	7.70@7.80
21	18.50@18.70	45.00	48.75@49.25	8.50	8.50	7.70@7.80

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for prompt and nearby deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point. All prices are in cents per pound.

Copper is commonly sold on terms "delivered," which means that the seller pays the freight from refinery to buyer's destination. The delivery cost varies, and it would be confusing to figure net prices on individual transactions. Consequently, an average deduction is made from the "delivered" price. At present the average cost of delivery from New York refineries is 0.15c. per lb., and that deduction is made to arrive at the New York price. When copper is sold f.o.b. or f.a.s. New York, of course no deduction is made.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other special shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

July	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3 M	Spot	3 M	Spot	3 M
	Spot	3 M							
15	90¼	92¼	106	265¾	271½	34	35½	41	42½
16	90	92½	106	267¾	272¾	33½	35	40¾	42¼
17	...	...	...	...	...	...	...	...	...
19	90¼	92¾	106	268½	273	34¼	35¾	41½	43¼
20	91¼	93¾	109	268½	272	34¼	35½	41¾	43½
21	90¾	93¼	109	262½	267½	34¾	36	41	42¾

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb.

Metal Markets

New York, July 21, 1920

No change of importance has taken place in the copper, tin, or zinc markets in the last week. Lead is the only active metal. Labor conditions in New England seem better, and if the Connecticut and Rhode Island wire and brass mills resume normal operation, sales of copper and zinc may pick up. Manufacturing interests in many cases are holding off to see if railroad employees will strike for wages higher than those just announced by the Railroad Labor Board.

Copper

The incipient buying movement proved of meager proportions, and the market during the last week has been dull. The large producers continue to hold for 19c., delivered, for September and October metal, and several million pounds have been sold at this figure. Smaller producers and outsiders are accepting down to 18¾c., delivered, and small lots of spot metal can be obtained at 18½c., delivered. The London price for electrolytic has advanced owing to low sterling exchange. It is now more nearly comparable to New York.

Lead

None of the large producers has a pound of lead for July or August delivery, and the scarcity of prompt metal has extended to deliveries in September. Sensing this, consumers and dealers became somewhat alarmed, and many inquiries developed at the end of last week, with several sales for September and October delivery at advancing prices. Production, both abroad and at home, is below normal, but demand continues good. With these conditions, and with the London price firm, the A. S. & R. advanced its New York contract quotation to 8½c. this morning. This augurs well for the future, and the price should increase rather than decrease during the next few months.

Spot metal sold late last week for 8.70c., St. Louis. Most of the inquiries for near-by positions are from dealers and speculators.

Conditions are very bad in Mexico again, labor strikes, dynamiting of railroads, fever epidemics, shortage of ships. and general disturbances attending the latest revolution. As a result, Mexican lead is not being received here, and about 1.200 tons has been engaged from England during the last week to make up the deficiency which will exist on contracts already made, based on the usual Mexican production.

Zinc

No change in conditions can be detected. The market has been quiet, and London seems to be pretty well liquidated. Production in Missouri continues below normal. The zinc situation is discussed on page 191.

Tin

Little business has been done, and dealers have given up guessing the market. They feel, however, that consumers will have to come in soon. The prevailing unstable condition of silver and sterling exchange has considerable effect on the price of tin. Sales of electrolytic picked up slightly, at a discount of 1¾@2c. per lb. under Straits.

Straits tin for future delivery: July 15th, 49.50@50c.; 16th, 50@50.25c.; 17th, 49.75@50c.; 19th, 49.50@49.75c.; 20th, 49.25@49.50c.; 21st, 48.75@49.25c.

Arrivals of tin, in long tons: July 14th, Hongkong, 10; Straits, 150; 15th, Hongkong, 10; Batavia, 200; Liverpool, 65; London, 25; 16th, Straits, 100; 19th, Liverpool, 50.

Silver

The domestic demand continues limited. The general undertone, however, for the silver market has improved, and with the U. S. Government buying all

our domestic production under the Pittman Act, and with the Mexican government now buying approximately 1,000,000 oz. per month of the Mexican product for Mexican mintage, the offerings of silver are more limited.

The New York quotation for foreign silver has been depressed this last week, owing to the lower quotation from London as well as to the sharp decline in sterling exchange.

Mexican Dollars—July 15th, 69½c.; 16th, 68⅝c.; 17th, 67⅞c.; 19th, 67¼c.; 20th, 67⅞c.; 21st, 71c.

Gold

Gold in London on July 15th, 106s. 6d.; 16th, 106s. 6d.; 19th, 107s.; 20th, 107s. 9d.; 21st, 107s. 3d.

Foreign Exchange

Increased European exports during the current month, particularly of wheat, have brought an unusual number of foreign bills on to the market, which has consequently depreciated exchange rates.

Pursuant to a new custom which has been introduced, we will hereafter quote francs and lire, as well as other foreign money, in cents to the unit. On Tuesday francs were 8.19c.; lire, 5.79c.; marks, 2.54c.; and New York funds in Montreal, 13⅛ per cent premium. South American exchanges broke violently. Yesterday Argentine exchange was 90.4c., compared with 107.9c. a week ago, and Brazilian, 22.0c., compared with 23.5c last week.

Other Metals

Aluminum—Ingot, 33c. per lb., with 32c. open market for 98@99 per cent virgin.

Antimony—Market continues weak. Spot, 7½c. per lb.; Cookson's "C" grade, 14c. Chinese and Japanese brands, 7⅝c. W. C. C. brand, 9c. Chinese needle antimony, lump, firm at 9@10c. per lb. Standard powdered needle antimony (200 mesh), 10@12c. per lb.

Bismuth—$2.70 per lb., 500-lb. lots. Market quiet.

Cadmium—Nominal, $1.40@$1.50 per lb. Market dull.

Cobalt—Metal, $2.50 to $3 per lb.; black oxide, $2 per lb.

Iridium—Nominal, $350 per oz. Heavy demand, but small supplies.

Magnesium—Crude, 99 per cent or over pure, $1.75 per lb., for the metal in 100 lb. lots and over, f.o.b. Niagara Falls.

[1]**Molybdenum Metal** in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c.; Monel metal, shot, 35c.; blocks, 35c., and ingots, 38c. per lb.

Osmium—Open market, $50@$75 per troy oz.

Palladium—$80 per oz.

Platinum—Market weak at $80@$85 per oz.

Quicksilver — Market weaker; $90@$92 per 75-lb. flask. San Francisco wires $85. Firm.

Ruthenium—$200@$220 per troy oz.

[1]**Selenium**, black, powdered, amorphous, 99.5 per cent pure, $1.75@$2 per lb.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $18@$20 per lb.

Metallic Ores

Bauxite—About 52 per cent alumina content, less than 2 per cent iron oxide, up to 20 per cent silica and artificially dried to contain not more than 4 per cent free moisture, $10 per gross ton at mine; 54 per cent alumina and about 15 per cent silica, $11; averaging 57 per cent alumina, 8 to 12 per cent silica, less than 3 per cent iron oxide, $13 on basis of 8 per cent free moisture. Ores of very low silica content suitable for the manufacture of aluminum oxide and hydrate of alumina command a fancy price.

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a minimum of 6 per cent silica, 77@85c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 60@65c. per unit, f.o.b. mines.

Iron Ores—Lake Superior ores, per ton, delivered at Lower Lake ports: Old Range bessemer, $7.45; Old Range non-bessemer, $6.70; Mesabi bessemer, $7.20; Mesabi non-bessemer, $6.55. Congestion at Lake Erie ports due to car shortage has resulted in decreased tonnage. Other ports show gain in shipments.

Manganese Ore—75@80c. per unit, 50 per cent Mn content, c.i.f. Atlantic seaport; chemical ore (MnO_2) $75@$85 per gross ton.

Molybdenum—85 per cent MoS_2, 60@85c. per lb. of contained sulphide, New York.

[1]**Tantalum Ore**, guaranteed minimum 60 per cent tantalic acid, 65@70c. per lb. in ton lots.

Titanium Ores—Ilmenite, 52 per cent TiO_2, 2c. per lb. for ore. Rutile, 95 per cent TiO_2, 15c. per lb. for ore, with concessions on large lots or running contracts.

Tungsten Ore—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $7 f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, $6.50@$7.50, in New York.

Uranium Ore (Carnotite)—$2.75@$3 per lb. for 96 per cent of the contained oxide (U_3O_8). Ores must contain a minimum of 2 per cent U_3O_8.

Vanadium Ore—$1.25 per lb. of V_2O_5 (guaranteed minimum of 11 per cent V_2O_5), New York.

Zircon—Washed, iron free, 10c. per lb. Zirkite—$90@$100 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., July 17—Zinc blende, per ton, high, $51.40; basis 60 per cent zinc, premium, $48.50; Prime Western, $47.50; fines and slimes, $45@$42.50; calamine, basis 40 per cent zinc, $35. Average settling prices: Blende, $42.98; calamine, $34.46; all zinc ores, $42.94.

Lead, high, $98.50; basis 80 per cent lead, $90@$92.50; average settling price, all grades of lead, $96.33 per ton.

Shipments for the week: Blende, 8,682; calamine, 150; lead, 1,454 tons. Value, all ores the week, $521,450.

Blende was freely negotiated today on $47.50 basis, with several buyers holding back until noon on $45 basis offerings. Lead ore was advanced $2.50 per ton today.

By not operating night shifts the production is lessened to the demand, and with no ore for sale on $45 basis buyers compromised the demand of sellers for $50 basis, and the sellers let it go.

Platteville, Wis., July 17—Blende, basis 60 per cent zinc, $51 to $52 base for high grade. Lead ore, basis 80 per cent lead, $90 per ton. Shipments for the week: Blende, 1,229; calamine, none; lead, 130; sulphur ore, 110 tons. Shipments for the year: Blende, 38,909; calamine, 2,240; lead, 3,494; sulphur ore, 1,098 tons. Shipped during the week to separating plants, 2,016 tons blende.

Non-Metallic Minerals

Asbestos — Crude, No. 1, $1,800@$2,500; No. 2, $1,100@$1,500; spinning fibres, $400@$700; magnesia and compressed sheet fibres, $300@$400; shingle stock, $100@$150; paper stock, $60@$80; cement stock, $17.50@$30; floats, $8.50@$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax. Freight rate from mines to Sherbrooke, Quebec, over Quebec Central R.R., 20c. per cwt.; from Sherbrooke to New York, 27½c., carload lots; freight to New York for crude No. 1, f.o.b. Thetford mines, $8.45 per ton, carload lots.

Barytes — Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $22@$25 in bags, carload lots; (off-color) $18@$20 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $12 per gross ton; ground (white) $23@$25; ground (off color) $16@$19 per net ton, f.o.b. Cartersville, Ga. Crude, 88 to 94 per cent, $23; ground (white) $40.50; ground (off color) $27 per net ton, less than carload lots, f.o.b. New York. Crude, not less than 98 per cent, $11@$11.25 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—Domestic, extra light, 5@6c. per lb.; light, 4½@5½c.; heavy, 4@5c; English, extra light, 5@7c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin) — Crude, $9@$12; washed, $12@$15; powdered, $18@$22; bags extra, per net ton, f.o.b. mines, Georgia; crude, $8@$12; ground, $15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@

[1] Furnished by Foote Mineral Co., Philadelphia, Pa.

$30; imported lump, $25@$35; powdered, $30@$60, f.o.b. New York.

Feldspar—Crude, $7.50@$8 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10 f.o.b. Maine; ground, $22@$30, car lots, f.o.b. Baltimore; ground, $22@$30, f.o.b. North Carolina points; $17@$20 per ton, No. 1 ground, f.o.b. New York State; $21@$23 per ton, ground, f.o.b. Maine.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $25 per ton, f.o.b. Kentucky and Illinois mines; ground, suitable for acid, chemical or enameling purposes, $60; lump, $17.50, f.o.b. Tonuco, N. M.

Graphite—Crucible flake, 85 per cent carbon content, 8c. per lb.; 88 per cent, 9½c.; 90 per cent, 10½c., all f.o.b. New York. Crucible grades of Alabama graphite sell as follows, f.o.b. Ashland, Ala.: 80 per cent, 5c.; 90 per cent, 10c. Good demand for lubricating grades at 20c. upward, in less than car lots. Stove polish grades (25 to 30 per cent carbon), 1c., in car lots. Facing grades (45 to 50 per cent carbon), strong at 2@2½c. per lb. Mexican, amorphous, $45 @$55 per short ton; Korean, 3½c. per lb.; Madagascar, 8c.; Ceylon, 4½@15½c.

Gypsum—Raw crushed rock, $3.50@ $4 per ton; raw ground fine, $4@$4.50; calcined stucco, $9, all f.o.b. works. Containers extra. Wholesale, plaster of paris, carload lots, $3.75 per 250-lb. bbl., alongside dock, New York.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. Freshly ground calcined, suitable for flooring trade, $65@$75 per ton, f.o.b. Eastern points.

Dead-Burned — $32.50 per net ton, Chewelah, Wash.; $50@$60, Chester, Pa. (Magnesite brick — See Refractories.)

Mica—Imported block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20 @$1.40; No. 4, $2@$3; No. 3, $4.25@ $5; No. 2, $5.50@$7; No. 1, $8. Clear block: No. 6, 55c.; No. 5, $2; No. 4, $4; No. 3, $5.75; No. 2, $7; No. 1, $9; A1, $14; extra large, $25, all f.o.b. New York; ground, $85@$100 per ton, Philadelphia.

Monazite — Minimum of 6 per cent thorium oxide, $42 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $13; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60. There is no price schedule for spot for domestic uses.

Pumice Stone—Imported, lump, 4@ 50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish, fines, per unit 12c., c.i.f. Atlantic seaport; furnace size, 16½c.; run of mine, 12@14c.; domestic, fines, f.o.b. mines, 12@14c.

Quartz—(Acid tower) fist to head, $10; 1¼ to 2 in., $14; rice, $17, all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines. F.o.b. Wausau, Wis., the price is $16 per ton in car lots, and $20 in less quantities, including bags.

Sulphur—$18 per ton for domestic; $20 for export, f.o.b. Texas and Louisiana mines.

Talc—Paper making, $9.50@$14 per ton; roofing grades, $8.50@$9; rubber grades, $9@$15, all f.o.b. Vermont. California talc, $20@$35, talcum powder grade. Southern talc, powdered, carload lots, $12 per ton; less than carload, $15, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60 @$70; Canadian, $10@$20 per ton.

Mineral Products

Arsenic—White arsenic, 15½c. per lb.; sulphide, powdered, 20@21c. per lb., f.o.b. works, carload lots.

Nitrate—Soda, $3.85 per cwt., ex vessel, Atlantic ports. Market quiet.

Potassium Sulphate—Domestic, $2.25 @$2.50 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15-18 per cent material, $200@$250 per ton, f.o.b. Niagara Falls, N. Y.

[1]Ferrocerium—Per lb., $12@$15. Foreign conditions as affecting the price of American goods remain unchanged.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 17@18c. per lb. of chromium contained; 4 to 6 per cent carbon, 19@20c. f.o.b. works.

Ferromanganese—For 76@80 per cent, $225, freight allowed; Spiegeleisen, 18 to 22 per cent, $75, f.o.b. furnace.

Ferromolybdenum—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2.50@$3 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $60@$65; 50 per cent, $78@$85; 75 per cent, $150 @$160.

Ferrotungsten—70 to 80 per cent W, 85c.@$1 per lb. of contained tungsten, f.o.b. works.

Ferro-uranium—35-50 per cent U, $7 per lb. of U contained, f.o.b. works.

Ferrovanadium—Basis 30-40 per cent, $6.50@$8.25 per lb. of V contained, f.o.b. works.

Metal Products

Copper Sheets—No change in Jan. 7 price of 29½c. per lb.; wire, quoted 22½c.

Lead Sheets—Full lead sheets, 12½c.; cut lead sheets, 12½c. in quantity, mill lots.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Nickel Silver—Unchanged at 39½c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 26½c.; sheathing, 25½c.; rods, ½ to 3 in., 23½c.

Zinc Sheets—$12.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 12c. per lb.

Refractories

Bauxite Brick—56 per cent alumina, $145 per 1,000, f.o.b. Pittsburgh.

Chrome Brick—$85@$90 per net ton, carload lots, eastern shipping points.

Chrome Cement—45 to 50 per cent Cr_2O_3, $50 per net ton, and $55 in sacks, carload lots, eastern shipping points.

Clay Brick — First-quality fire clay, 9-in. shapes, $45@$53 per thousand, Pennsylvania, Ohio, and Kentucky works; second quality, $40. First quality, St. Louis, $45; New Jersey, $75.

Magnesite Brick—$90@$100 per ton, eastern shipping points; 9-in. straights, $90@$100; 9-in. arches, wedges and keys, $95@$105; soaps and splits, $110 @$120.

Silica Brick—Nine in. and 9-in. sizes, per 1,000, $51@$55, Birmingham, Ala.; $50@$55, Mount Union, Pa.; $55, Chicago district.

Iron Trade Review

Pittsburgh, July 20, 1920

Transportation affecting the shipment of pig iron and steel products has continued to grow worse, in general, although there may have been some improvement in spots. The worst conditions were in the latter part of April. In May and perhaps the first week or two of June there was improvement, conditions growing worse since then. Largely at the instance of the steel mills and blast furnaces, the Interstate Commerce Commission has defined a coal car, for interpretation of Service Order No. 7, giving car priority to coal mines, as excluding flat-bottom gondolas under 36 in. high, inside measurement, and this will help the iron and steel industry somewhat, as some roads were calling coal cars any gondolas over 30 in.

Pig Iron—Sales of several thousand tons each of bessemer and basic have been made, for early shipment, at $46, Valley, or $1 advance, foundry remaining quotable at $45, Valley, with $1.40 freight to Pittsburgh. Late deliveries do not interest buyers at any price. The question before the market is whether a buying movement or a selling movement will come first.

Steel—Mills show more readiness to sell semi-finished steel, presumably on account of their accumulations. Billets are still quotable at $60@$65, but are easier at that range. Sheet bars can be had at $70, against $75 formerly quoted.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 4½c. per lb., in 250-lb. bbls.

Connellsville — Furnace, $17@$18; foundry, $18@$18.50.

The Unsatisfactory Zinc Situation

Metal Has Recovered Slightly From Recent Drop, Production Generally Being Maintained—Foreign Business Decreasing; According to Recent Figures — Belgium Making Rapid Recuperative Progress—Future Outlook Not Very Bright

THE middle of June witnessed the lowest zinc quotation of the year, 7.30c. per lb., St. Louis. Quotations since then have gradually risen, and a month later a price of 7.85c. had been reached—a gain of over half a cent in the interval. Nevertheless, the price of zinc is far from satisfactory, and is generally below the cost of production for all but the most-favored operators. It is not likely that the serious problem presented by this condition can be met by shutting down operations, although the zinc mines in the Middle West could close with less trouble than larger Western mines.

Production Increased

Curiously enough, the low price of zinc has had little detrimental effect on production. Instead of a decreased output, as might be expected, production in the Joplin, Mo., district has actually increased. Shipments of zinc concentrates were 64,150 tons greater for the first half of 1920 than for the corresponding period in 1919, demonstrating that the productive power of the district was not diminished by any difficulty with labor or the high cost of supplies.

One of the main reasons given for maintaining production in the face of adverse conditions is the peculiar short-time leasing system in vogue in the Middle Western zinc and lead mining districts, whereby short-term leases on mineral-bearing Indian land necessitate quick development and ore extraction before the expiration of the lease. Naturally, an operator will not feel himself justified in abandoning operations which have entailed considerable expense in development, especially when no assurance is given that the lease will be renewed. Hence extraction occurs in feverish haste before the lease expires.

Those companies with large developed ore reserves which face the possibility of losing their land in the next two or three years will necessarily make every effort to secure the greatest possible return in the shortest possible time. Owing to this condition, any reduction in output except by arbitrary and concerted action by all the operators is not to be expected. Recently, voluntary action on the part of the Joplin operators resulted in a fortnight's respite from the recent heavy production. It is noticeable that, concurrently with this step on the part of the producers, the price of zinc stiffened, advancing slightly, but not sufficiently to warrant much optimism.

Another reason that production has been maintained or increased is the large demand for zinc in paint manufacture, in lithopone, and in the manufacture of zinc oxide for the rubber-tire industry.

At the same time that production has been increasing—with occasional relapses—there is little indication that domestic consumption of the metal itself is being accelerated, owing, no doubt, to the still serious railroad and coal troubles, which have also been such a detriment to prosperity in the copper and lead industries.

Foreign Business Diminishing

Export business has fallen off. For the month of April the exports of zinc amounted to 32,982,956 lb. and imports to 7,011,322 lb., leaving a net balance for the month of 25,971,634 lb., but in May the favorable balance dropped appreciably, as exports were only 19,610,210 lb., the imports being 4,046,418 lb., giving a net favorable balance of 15,565,791 lb. For the four months, February, March, April and May the favorable balance of exports has been gradually dwindling. Although this situation cannot be viewed with satisfaction, it must be accepted as a logical tendency, as the United States in normal times is accustomed to take care of its own production of zinc, consumption and production nearly equaling each other, the foreign demand being met mainly through foreign resources.

MOVEMENTS OF ZINC TO AND FROM THE UNITED STATES
(In Pounds)

Exports To	April	May
United Kingdom	18,373,026	13,896,975
France	11,159,902	2,548,674
Japan	168,059	511,617
Canada	68,052	92,686
Italy	.....	850,757
Argentina	.....	361,273
Belgium	.....	470,400
Others	131,732	877,828
Totals (pigs, slabs)	29,900,771	19,610,210
Rolled zinc	3,082,185	.....
Imports From	**April**	**May**
Mexico	4,510,839	2,653,621
Canada	34,935	124,707
Chile	.....	1,264,299
Others	2,447,280	.....
Totals (from ores)	6,993,054	4,042,627
Miscellaneous	18,268	3,791

It is worth noting that the lower price of zinc in London is not conducive to betterment in the falling export business, as European requirements can be more cheaply filled in London. Fortunately for the zinc producer, his business is not so dependent upon foreign orders as is that of the copper producer.

The following table, compiled from figures of the U. S. Geological Survey, indicates what the apparent consumption of zinc has been in the United States, compared with the production and the total available supplies for the last nine years:

U. S. ZINC PRODUCTION AND CONSUMPTION
(In Tons)

	United States Production Primary, Zinc	Apparent United States Consumption	Total Available Zinc
1910-1913 (Average)	310,298	290,413	327,255
1914	353,049	299,983	394,588
1915	489,519	364,855	510,518
1916	668,343	459,317	683,280
1917	669,573	413,643	687,428
1918	517,927	423,792	571,683
1919	465,743	323,964	507,054

The extraordinary conditions arising out of the war created an unusually large demand for United States zinc; hence the big discrepancy between consumption and production during the war years. The fact that some sources of zinc are still unavailable to Europe—notably Australian zinc—would be a boon for America were it not for the temporarily satiated European requirements and the stagnation in the market there. Some dispatches indicate that this condition will prevail for the next six months, which presents not a very bright prospect for the zinc business.

Belgian and Australian Labor Compared

The attitude of labor in the world's zinc industry is strikingly contrasted by conditions in Australia and those in Belgium. The little European nation is exhibiting remarkable recuperative powers, and no small measure of the credit for this turn of affairs is due to the willingness of labor to co-operate eagerly and assume its share of responsibility in placing the Belgian zinc industry upon its feet again. The Australian situation is a sorry spectacle by comparison. The Broken Hill strike, which has caused millions of dollars' loss to capital and labor, seems no nearer settlement. Lately a round-table conference has been in session to help adjust matters, and the opinion is gaining that nationalization of the mines or operation by labor would not result in the benefits fancied. Last year Belgium is estimated to have produced 18,000 tons of zinc, and during the first four months of this year to have produced the metal at the rate of 80,000 tons per annum. This is a rapid advance considering that the pre-war produc-

tion was about 200,000 tons yearly. Increased Belgian output will have a tendency to offset the declining British production.

With the low price of zinc, the English smelters are having their troubles, and there is talk of governmental assistance to help them out of their difficulties. No satisfactory solution to the labor problem has been found, and the large smelter at Avonmouth, in which the government is interested, and which is expected to handle Australian concentrates formerly sent to Germany and Belgium, is neither operating nor exhibits any likelihood of being operated for some time. Germany is finding herself able to export an appreciable tonnage of zinc and has lifted the export ban to enable the traffic to proceed.

From Norway comes the news that the new electrolytic zinc refinery at Glamfjord which has been under construction will soon begin to operate. This will be the first refinery of its kind in Norway. In Tasmania the electrolytic zinc refinery at Risdon is considering increasing the output of electrolytic zinc from 100 tons to 140 tons per week. It is significant that electrolytic zinc and some special brands have been maintaining a higher price differential than is normal. Prime Western brands are not in their customary favor.

The Future of Zinc

What the future of zinc will be is difficult to prophesy. An optimistic view would be that the metal bottomed in June, and that it is in for betterment, but there are so many vicissitudes to the market, and so many adverse factors which must be overcome against the general economic trend to lower prices, that substantial improvement would appear to be a slow process.

The price of lead is still higher than that of zinc, and whether the return to a normal ratio will progress through a lowering of the lead price or an advance in zinc cannot be foretold. The London market bids fair to remain below the United States market for several months, and this condition alone would tend to prevent material improvement in the quotations. There is the question, of course, as to whether the London price will try to reach the United States quotation, or vice versa. In the meantime, commendable and successful attempts are being made in the United States to educate the people to new uses for zinc, and so to create a wider domestic consumption.

Copper Production in Norway

The copper deposits of Norway are similar to those of Spain, and are chiefly massive cupriferous pyrite. Their value lies not only in the copper content of the mineral but also in the iron, nickel, and sulphur contained. The latter element is frequently of more importance than the copper, owing to its application in the manufacture of sulphuric acid.

Recent figures on the copper production of Norway are not easy to obtain. Consul General Marion Letcher, at Christiania, reports that the raw copper produced in Norway from non-pyritic ores and from nickel-copper ores in 1916 and 1917 was as follows:

Smelter	1916, Pounds	1917, Pounds
Christiansand Nickel Refinery	1,221,382	758,755
Roros Copper Refinery	531,314	901,690
Sulitjelma Works	1,333,102	2,092,090
A/S Birtavarre Grüber	473,531	238,015

The production of copper ore in 1916 is given as 19,398 short tons, and in 1917, as 43,318 tons.

The production of copper pyrites for the years 1916 and 1917 was 325,571 and 362,323 short tons, respectively.

Norwegian Potash Manufacture

A local Norwegian paper calls attention to the fact that the Dalen portland cement factory expects soon to begin the manufacture of potash. This factory is situated at Dalen, near Brevik, in Norway. It was established in 1916, and is capitalized at 3,200,000 crowns ($857,600).

Movements of Metals and Ores

Imports and exports of the more important metals and ores, as reported by the Department of Commerce for May, 1919, and the figures for May, 1920, as finally revised, are as follows:

IMPORTS, MAY, 1919, AND MAY, 1920

(In pounds, unless otherwise stated)

	May, 1919	May, 1920
Antimony ore, contents	58,880	26,625
Antimony matte, regulus or metal	526,400	2,296,000
Copper:		
Ore, contents	3,159,699	5,449,040
Concentrates, contents	1,870,957	4,720,868
Matte, regulus, etc., contents	2,915,904	437,463
Imported from (in part):		
Canada	2,342,065	2,277,313
Mexico	4,537,982	2,778,787
Cuba	793,632	1,453,742
Chile	None	1,469,999
Peru	94,781	539,129
Unrefined, black, blister, etc	15,997,164	23,920,357
Refined, in bars, plates, etc	853,436	18,580,986
Old, etc., for remanufacture	14,995	665,121
Composition metal, copper chief value	None	87,076
Lead:		
Ore, contents	2,565,390	5,623,742
Bullion, contents	6,683,731	3,258,425
Imported from (in part):		
Canada	801,786	202,880
Mexico	6,940,331	8,413,133
Chile	1,507,004	91,336
Pigs, bars and old	5,440	3,170,707
Manganese ore, long tons	19,644	56,586
Imported from (in part):		
Cuba, long tons	195	118
Brazil, long tons	12,212	30,100
British India, long tons	None	14,300
Tungsten ore, long tons	285	96
Pyrites, long tons	33,263	25,329
Imported from:		
Spain, long tons	29,951	17,629
Canada, long tons	420	7,700
Tin ore, long tons	2	3,120
Tin bars, blocks, pigs, etc	449,064	9,102,341
Imported from (in part):		
Straits Settlements	224,870	4,286,663
Dutch East Indies	None	187,043
United Kingdom	224,000	3,065,287
Australia	None	236,241
Hongkong	None	973,011
Zinc:		
Ore, contents	584,619	4,042,627
Imported from:		
Canada	77,000	124,707
Mexico	507,619	2,653,621
Blocks or pigs, and old	66,898	None

EXPORTS OF COPPER, LEAD AND ZINC

(In pounds)

	May, 1919	May, 1920
Copper:		
Ore, contents	161,500	None
Concentrates, contents	None	None
Unrefined, black, blister, etc	None	111,880
Refined, in ingots, bars, etc	18,686,929	72,107,577
Exported to (in part):		
France	None	17,803,625
Italy	1,368,267	81,364
United Kingdom	10,053,311	14,810,044
Canada	1,854,518	3,877,894
Japan	1,120,000	9,184,000
Germany	None	7,055,336
Sweden	1,456,112	6,458,806
Switzerland	1,925,482	336,087
Composition metal, copper chief value	20,900	61,524
Old and scrap	45,583	13,698
Pipes and tubes	433,908	364,719
Plates and sheets	856,089	4,883,671
Wire, except insulated	3,971,415	5,248,746
Lead:		
Pigs, bars, etc.:		
Produced from domestic ore	370,883	364,086
Produced from foreign ore	1,905,041	4,785,752
Exported to (in part):		
Canada	369,651	62,674
United Kingdom	1,568,146	1,021,144
Argentina	11,212	448,000
Brazil	133,907	593,363
China	4,402	None
Japan	None	2,464,000
Netherlands	None	291,200
France	None	None
Zinc:		
Dross	182,703	675,593
Spelter:		
Produced from domestic ore	10,804,672	14,868,768
Produced from foreign ore	176,000	2,134,383
Exported to (in part):		
France	1,394,800	2,483,939
Italy	756,758	336,000
United Kingdom	6,288,240	13,460,960
Canada	233,437	None
In sheets, strips, etc	1,335,924	2,607,059

Great Fall in Metal Prices in Germany

From Our Vienna Correspondent.

Dated June 24, 1920.

The trade crisis in metals has become still more acute in Germany. As a result of their high value and the quantity imported for industrial purposes, metals are at present the most important subjects in the list of German imports. The copper consumption has fallen to about one-half of that needed in the pre-war period, as the result of labor difficulties, lack of fuel coal and the prevailing trade crisis, but as a result of the increase in prices its value has increased almost fourfold. The value of the present copper import of Germany may be safely placed at tenfold that of the pre-war importation. The general fall in prices will bring about further weakening in metal prices, and only the most necessary needs will be covered.

The effect of exchange naturally is most noticeable in the drop of the Berlin quotations as they fell from their maximum of 4,700 marks per metric ton in February to 1,609 marks at the end of May, that is, a drop of almost 65 per cent. Since then they have recovered to the level of 1918 marks.

In zinc, German trade is quiet; only small quantities exchange hands. Since the maximum of March it fell 68 per cent, or from 1,675 marks to 525-550 per hundred kilos, and has since risen to about 600 marks.

Tin prices have been subject to great variations. The domestic price for Germany, at 5,100 and 5,200 marks, still stands considerably above the London par, and at the end of January tin had reached a level of 16,000 marks per hundred kilos, indicating a decrease of 71 per cent.

German prices of lead have generally stood below the international market price since January and particularly below the New York quotations. From the maximum price of 1,800 marks, which was reached at the end of February, it dropped to 500 marks in June, a fall of 80 per cent.

The world's market price for silver has been higher than the German domestic price. The German quotation for aluminum has been more than counterbalanced by the fall in exchange rates, so that in Germany it has fallen by one-half since February. The Eisenwirtschaftsbund, in consideration of a cheapening in comparison with foreign ores and as a result of the rise in the value of the mark, have reduced prices per ton (1,000 kg.) as follows: Hematite by 200 marks, down to 2,150 marks; steel of low copper content, by 200 marks, to 2,140 marks; foundry pig iron No. 2, by 50 marks, to 1,740 marks; foundry pig iron No. 3, by 50 marks, to 1,739 marks; ferromanganese, 50 per cent, by 570 marks; ferrosilicon, 10 per cent, by 200 marks; tempered pig iron, by 182 marks.

The general market situation and particularly the reduction in prices of other products also has resulted in an oversupply.

Spain's Metal Production

The latest authoritative figures available regarding the metal production of Spain are those for the year 1918, published by the "Chambre Syndicale Francaise des Mines Metalliques." A table summarizing the production in metric tons follows:

Metal	1916	1917	1918
Iron and steel	322,931	470,242	303,206
Copper	32,880	38,526	45,104
Zinc	8,523	10,155	15,900
Lead	147,407	172,909	169,709
Mercury	795	827	567
Silver (kilograms)	140,521	114,342	98,988

A comparative table of exports of metals from Spain follows:

	1917	1918
Iron and steel	32,848	29
Copper	30,660	20,492
Zinc	.....	3,828
Mercury	650	705
Lead, pig	133,460	127,420
Argentiferous lead	21,219	16,110
Silver (kilograms)	62,408	47,954
Gold (kilograms)	1.4	55

With but two exceptions, the exports materially decreased during the last war year.

COMPANY REPORTS

Oroville Dredging Co., Ltd.

Gold; Colombia

The annual report of the Oroville Dredging Co., Ltd., a British corporation, for the fiscal year ending Sept. 30, 1919, states that the American Oroville Co.—the original operating company—having gone into liquidation, and dredging in the properties having ceased through exhaustion of the gravel reserves, the receipts from the liquidation of the company, amounting to £36,181 14s. 6d., are written off the valuation of the 686,531 shares of $5 each, reducing it to £650,349 5s. 6d.

There are held in the Nechi Mines (Colombia), Ltd., 125,993 ordinary shares of 10s. each and in the Pato Mines (Colombia), Ltd., 73,918 5/10 shares of £1 each, fully paid. During the year under review dividends were received from the company's holdings in Nechi Mines (Colombia), Ltd., amounting to £59,846 13s. 6d., and in Pato Mines (Colombia), Ltd., £11,087 15s. 6d. Including other fees, and after debiting all charges in London, the balance to credit of profit and loss account for the year is £69,653 14s. 8d. Four quarterly dividends of 6d. per share were paid during the year, and totaled £68,653 16s. 0d. A balance of £25,367 7s. 5d. remained to the credit of profit and loss account on Sept. 30, 1919.

During the year, 1,379,331 cu.yd. were dredged by the Pato company, compared with 1,345,215 for the previous year, the gross value of the gold recovered being $489,953 (average 35.5c. per cu.yd.), with an average depth of gravel dredged of 31.4 ft., against $266,062 (average 20c. per cu.yd.), for the previous year, with an average depth of 33.2 ft. The field cost for the year was 8.77c. per cu.yd., compared with 11.16c. for the previous year. The yield was 27.3 per cent greater than the prospecting estimate for the area dredged.

The London accounts of the Pato company show a profit of £29,723 19s. 3d. after providing for £26,206 1s. 10d. depreciation. The credit to profit and loss at Sept. 30, 1919, amounted to £195,475 1s. 5d.

There were dredged in the Nechi company's property 1,042,464 cu.yd. for the last nine months of the fiscal year, the gross value of the gold recovered being $450,763, averaging 43c. per cu.yd., with an average depth of gravel dredged of 46.3 ft. The field cost was 7.75c. per cu.yd. The London accounts of the Nechi company show a net profit for the year of £61,994 19s. 8d.

Chile Copper Co.

Copper; Chile

The thirteenth quarterly report of the Chile Copper Co. covering operations for the first quarter of 1920, indicates a production of 25,390,987 lb. of copper, compared with 22,916,740 lb. during the fourth quarter of 1919. There was sold 32,704,410 lb. of copper during the first quarter of 1920, or almost twice as much as in the previous quarter (16,466,812 lb.).

The financial outcome of the Chile Copper Co. and the Chile Exploration Co. combined (earnings being based upon copper actually sold and delivered) shows the following comparison:

	First Quarter 1920	Fourth Quarter 1919
Net profit on copper delivered (after deducting depreciation)	$1,849,749.56	(a)$300,211.27
Miscellaneous income	58,587.30	423,967.07
Interest on call loans and bank balances of Chile Copper Co.	147,754.02	105,444.56
Total	$2,056,090.88	$229,200.36
Amortized discount on 15 year 6 per cent convertible bonds	$35,000.00	$35,000.00
Accrued bond interest of Chile Copper Co.	786,499.35	785,818.00
Expenses of Chile Copper Co.	1,555.22	701.26
Balance undivided profits, both companies	$1,233,036.31	a 590,916.38

(a) Loss.

MINING STOCKS

Week Ended July 17, 1920

Stock	Exch.	High	Low	Last	Last Div.	
COPPER						
Adventure	Boston	...	...	*75		
Ahmeek	Boston	61½	60	60	June '20, Q	.50
Alaska-B.C.	N. Y. Curb	1	⅞	1⅛		
Allouez	Boston	...	...	28½	Mar. '19,	1.00
Anaconda	N. Y.	57½	54½	55½	Feb. '20, Q	1.00
Ariz. Com'l	Boston	11½	10	10	Oct. '18,	.50
Big Ledge	N. Y. Curb	1/16	1/16	1/16		
Bingham Mines	Boston	9½	9	9	Sept. '19, Q	.25
Calumet & Ariz.	Boston	59½	57½	57½	June '20, Q	1.00
Calumet & Hecla	Boston	315	310	310	June '20, Q	5.00
Can. Copper	N. Y. Curb	1/16	1/16	1/16		
Centennial	Boston	...	...	11½	Dec. '18, SA	1.00
Cerro de Pasco	N. Y.	44½	42⅞	43	June '20, Q	1.00
Chief Consol.	Boston Curb	4	3⅜	3⅜	Feb. '20, Q	.10
Chile Cop	N. Y.	15⅞	14⅛	14⅛		
Chino	N. Y.	31	29½	29½	June '20, Q	.37½
Columbus Rexall	Salt Lake	48½	*46	*46		
Con. Ariz.	N. Y. Curb	...	...	1/16	Dec. '18, Q	.05
Con. Copper M.	N. Y. Curb	...	...	2⅛		
Copper Range	Boston	38⅞	37½	38	June '20, Q	50
Crystal Cop. (new)	Boston Curb	*38	*29	*30		
Davis-Daly	Boston	9	8⅜	8⅜	Mar. '20, Q	.25
East Butte	Boston	12⅜	12¼	12¼	Dec. '19, A	.50
First Nat'l	Boston Curb	*99	*90	*93	Feb. '19, SA	.15
Franklin	Boston	1⅜	*65	*70		
Gadsden Copper	N. Y. Curb.	...	...	*71		
Granby Consol.	N. Y.	38	37½	38	May '19, Q	1.25
Greene-Can.	N. Y.	31	30	30	Feb. '19, Q	1.50
Hancock	Boston	4⅛	4	4		
Houghton	Boston Curb	...	...	*60		
Howe Sound	N. Y. Curb.	3¼	3⅛	3⅛	July '20, Q	.05
Inspiration Con.	N. Y.	52	49½	49⅝	July '20, Q	1.00
Iron Cap	Boston Curb	...	...	9	Feb. '19, M	.25
Isle Royale	Boston	30	30	30	Sept. '19, SA	.50
Kennecott	N. Y.	26¼	25	25⅛	June '20, Q	.50
Keweenaw	Boston	1⅜	1⅜	1⅜		
Lake Copper	Boston	3¼	3¼	3¼		
La Salle	Boston	2½	2½	2½		
Magma Chief	N. Y. Curb.	...	...	*21		
Magma Copper	N. Y. Curb.	30	30	30	Jan. '19, Q	.50
Majestic	Boston Curb	...	...	*18		
Mason Valley	N. Y. Curb.	...	...	2⅛		
Mass. Con.	Boston	3⅛	3⅛	3⅛	Nov. '17, Q	1.00
Mayflower-O.C.	Boston	5⅝	5	5		
Miami	N. Y.	21¼	20⅛	20⅛	May '20, Q	.50
Michigan	Boston	4½	4½	4½		
Mohawk	Boston	62	61	62	Feb. '20, Q	1.50
Mother Lode (new)	N. Y. Curb.	6	5⅛	5⅛		
Nevada Con.	N. Y.	13	12⅛	12⅛	June '20, Q	.25
New Arcadian	Boston	...	...	2⅛		
New Baltic	Boston Curb	...	...	3		
New Cornelia	Boston	17	16⅛	17	May '20,	.25
Nixon Nev.	N. Y. Curb.	...	...	*9		
North Butte	Boston	17⅛	16⅛	16⅛	Oct. '18, Q	.25
North Lake	Boston	*70	*60	*60		
Ohio Copper	N. Y. Curb.	...	...	1/16		
Ojibway	Boston	1⅛	1⅛	1⅛		
Old Dominion	Boston	26	24½	24½	Dec. '18, Q	1.00
Osceola	Boston	41	38½	38½	June '20, Q	.50
Phelps Dodge	Open Mar.	†195	†180	...	July '20, Q	2.50
Quincy	Boston	51	49	49⅛	Mar. '20, Q	1.00
Ray Con.	N. Y.	16⅜	16⅛	16⅛	June '20, Q	.25
Ray Hercules	Boston Curb	...	...	*75		
St. Mary's M. L.	Boston	42	42	42	June '20, K	2.00
Seneca	Boston	*13½	13	13⅛		
Shannon	Boston	1⅛	1⅛	1⅛	Nov. '17, Q	.25
Shattuck Ariz.	N. Y.	9	9	9	Jan. '20, Q	.25
South Lake	Boston	2⅛	2⅛	2⅛		
South Utah	Boston	...	...	*14		
Superior	Boston	...	...	5	Apr. '17,	1.00
Superior & Boston	Boston	3⅛	3½	3½		
Tenn. C. & C.	N. Y.	10	9⅛	9⅛	May '18, I	1.00
Tuolumne	Boston	*60	*58	*60	May '13,	.10
United Verde Ex.	Boston Curb	32	31	31⅛	June '20, Q	1.50
Utah Con.	Boston	6⅜	6⅛	6⅛	Sept. '18,	.25
Utah Copper	N. Y.	68⅛	66⅛	67	June '20, Q	1.50
Utah M. & T.	Boston	1½	1½	1½	Dec. '17,	.30
Victoria	Boston	2⅛	2	2⅛		
Winona	Boston	*60	*50	*50		
Wolverine	Boston	15¼	15	15	Jan. '20, Q	.50
LEAD						
Hecla	N. Y. Curb.	4⅛	3⅞	4	June '20, QX	.20
St. Joseph Lead	N. Y.	15⅜	15⅛	15⅛	June '20, QX	.50
Stewart	Boston Curb	...	...	*16	Dec. '15,	.05
Utah Apex	Boston	1⅛	1⅛	1⅛	Nov. '18,	.25
ZINC						
Am. Z. L. & S.	N. Y.	15⅞	14	14	May '17,	1.00
Am. Z. L. & S. pf.	N. Y.	49	49	49	May '20, Q	1.50
Butte C. & Z.	N. Y.	9⅛	8⅛	9	July, '18, I	.50
Butte & Superior	N. Y.	23	22½	23	Sept. '17,	1.25
Con. Interst. Cal.	N. Y.	13⅛	10⅛	11⅛	June '20, Q	.50
New Jersey Z.	N. Y. Curb.	197	192	194½	May '20, SA	4.00
Success	N. Y. Curb.	*5	*4	*4	July '16,	.03
Yellow Pine	Los Angeles	...	...	1.02	June '20, Q	.03

Stock	Exch.	High	Low	Last	Last Div.	
GOLD						
Alaska Gold	N. Y.	1½	1⅛	1⅛		
Alaska Juneau	N. Y.	2	1⅝	2		
Carson Hill	N. Y. Curb.	28	25	25½		
Cresson Consol. G.	N. Y. Curb.	...	...	1⅛	June '20, Q	.10
Dome Ex.	Toronto	*24	24½	*24½		
Dome Mines	N. Y.	9⅝	9⅛	9⅛	July '20, Q	.25
Golden Cycle	Colo. Sprgs.	‡	...	*73	May '20, Q	.02
Goldfield Con.	N. Y. Curb.	*11	*9	*10	Dec. '19,	.05
Hedley	Boston	...	...	4½	June '19,	.10
Hollinger Con.	Toronto	5.75	5.65	5.75	June '20, BM	.05
Homestake	N. Y.	...	...	55	Sept. '19,	.50
Kirkland Lake	Toronto	*49	*48⅛	*48⅛		
Lake Shore	Toronto	1.18	1.17	1.17	Oct. '19,	.02½
McIntyre-Porcupine	Toronto	1.85	1.83	1.83	May '20, K	.05
Porcupine Crown	Toronto	*29	*28½	*29	July '17,	.03
Portland	Colo. Sprgs.	‡	...	*60	July '20, Q	.01½
Reorgan. Booth	N. Y. Curb.	*6	*5	*5½	May '19,	.05
Silver Pick	N. Y. Curb.	*6	*5	*5½		
Teck Hughes	Toronto	*10½	*10½	*10½		
Tom Reed	Los Angeles	1.10	1.00	1.00	Dec. '19,	.02
United Eastern	N. Y. Curb.	2⅛	2	2 1/16	Apr. '20, Q	.21
Vindicator Consol.	Colo. Sprgs.	‡	...	*18	Jan. '20, Q	.01
West Dome	Toronto	*6½	*6¼	*6½		
White Caps Min.	N. Y. Curb.	*11	*9½	*10½		
Yukon Gold	Boston Curb	....	....	1	June '18,	.02½
SILVER						
Arizona Silver	Boston Curb	*18	*12	*14	Apr. '20, M	.03
Beaver Con.	Toronto	*45¼	*43	*44½	May '20, K	.03
Coniagas	Toronto	...	†2.50	...	May '20, Q	.25
Crown Reserve	Toronto	*22	*20	*22	Jan. '17,	.05
Kerr Lake	Boston	3½	3¼	3¼	Sept. '19,	1.00
La Rose	Toronto	*38	*38	*38	Apr. '18,	.02
McKinley-Dar.	N. Y. Curb.	*50	*50	*50	July '20, Q	.03
Mining Corp.	Toronto	1.95	1.95	1.95	June '20, Q	.12½
Nipissing	N. Y. Curb.	8⅛	8⅛	8⅛	July '20, Q	.25
Ontario Silver	N. Y.	6¼	6¼	6¼	Jan. '19, Q	.50
Ophir Silver	N. Y. Curb.	1/16	1/16	1/16	Jan. '12,	.10
Peterson Lake	Toronto	*13¼	*12½	*13	Jan. '17,	.01¼
Sil. King Ariz.	N. Y. Curb.	*38	*32	*32		
Temiskaming	Toronto	*38½	*36¼	*36¼	Jan. '20, K	.04
Trethewey	Toronto	*31	*29½	*30	Jan. '19,	.05
GOLD AND SILVER						
Atlanta	N. Y. Curb.	*2	*1	*1⅛		
Barnes-King	Butte	‡	...	1.28	Nov. '19, Q	.05
Bost. & Mont.	Boston	*64	*62	*63		
Cashboy	N. Y. Curb.	*6½	*5½	*6		
El Salvador	N. Y. Curb.	1⅛	1⅛	1⅛		
Jim Butler	N. Y. Curb.	*14	*12½	*14	Aug. '18, SA	.07
Jumbo Extension	N. Y. Curb.	*6	*5	*6	June '16,	.05
Louisiana Con.	N. Y. Curb.	1/16	1/16	1/16		
MacNamara M.	N. Y. Curb.	1/16	1/16	1/16	May '10,	02½
N.Y. Hond. Rosar	Open Mar.	†14	†12½	...	July '20, QX	.50
Tonopah-Belmont	N. Y. Curb.	1 13/16	1⅛	1 13/16	Jan. '20, Q	.05
Tonopah-Divide	N. Y. Curb.	1 1/16	1⅛	1 1/16		
Tonopah Ex.	N. Y. Curb.	1⅛	1⅛	1 1/16	July '20, Q	.05
Tonopah Mining	N. Y. Curb.	1⅛	1⅛	1 1/16	Oct. '19, SA	.15
West End Con.	N. Y. Curb.	1⅛	1⅛	1 1/16	Dec. '19 SA	.05
SILVER-LEAD						
Caledonia	N. Y. Curb.	*24	*22	*22	July, '20, M	.01
Consol. M. & S.	Montreal	26	25	25¼	July '20, Q	.62½
Daly-West	Boston	4⅜	4⅛	4⅛	July '20, Q	.25
Eagle & Blue Bell	Boston Curb	...	...	2 1/16	Apr. '20, Q	.10
Electric Point	Spokane	32	30	30	May '20, SA	.03
Fed. M. & S.	N. Y.	...	...	13½	Jan. 09,	1.50
Fed. M. & S. pf.	N. Y.	...	...	36	June, '20, Q	1.75
Florence Silver	Spokane	...	...	*45	Apr. '19,	.01½
Iron Blossom	N. Y. Curb.	...	...	⅛	Apr. '20, Q	02½
Judge M. & S.	Salt Lake	‡	...	4.00	July '20, Q	12½
Marsh Mines	N. Y. Curb.	...	...	*12		
Prince Consol.	N. Y. Curb.	1/16	⅛	⅛	Nov. '17,	.02½
Rambler-Cariboo	Spokane	*10	*10	*10	Feb. '19,	.01
Rex Con.	N. Y. Curb.	*7	*6	*7		
South Heola	Salt Lake	‡	...	*94	Sept. '19, K	0.15
Stand. S. L.	N. Y. Curb.	⅛	⅛	⅛	Oct. '17,	.05
Tamarack-Custer	Spokane	2.50	2.40	2.42	Dec. '19, K	.03
Tintic Standard	Salt Lake	3.45	3.30	3.37½	June '20, Q	0.10
Wilbert	N. Y. Curb.	*4½	*4	*4	Nov. '17,	.01
NICKEL-COPPER						
Internat'l Nickel	N. Y.	18⅛	17½	17½	Mar. '19,	.50
Internat'l Nick.pf	N. Y.	81	80¼	81	May '20, Q	1.50
QUICKSILVER						
New Idria	Boston	....	....	5	Jan. '19,	.25
TUNGSTEN						
Mojave Tungsten	Boston Curb	....	....	*10		
VANADIUM						
Vanadium Corp.	N. Y.	89⅜	82½	85	July '20, Q	1.50
ASBESTOS						
Asbestos Corp.	Montreal	88	86	88	July '20, Q	1.50
Asbestos Corp. pf.	Montreal	96½	95¾	96¼	July '20, Q	1.75
MINING, SMELTING AND REFINING						
Am. S. & R.	N. Y.	62¼	58⅜	58⅜	June '20, Q	1.00
Am. S. & R.pf.	N. Y.	91½	90⅜	90⅜	June '20, Q	1.75
Am. Sm. pf.A	N. Y.	74	74	74	July '20, Q	1.50
U. S. Sm. R. & M.	N. Y.	59½	57	57	July '20, Q	1.50
U.S.S.R.& M. pf.	Boston	44½	43½	44	July '20, Q	.87½

*Cents per share. †Bid or asked. ‡Quotations missing. Q, Quarterly.
SA, Semi-annually. BM, bimonthly. K, Irregular. I, Initial. X, includes extra